GAS

APRIL 1959

12th annual gas industry construction survey

A CHILTON PUBLICATION

THE NATION'S NATURAL GAS AUTHORITY

AMERICAN®

ALUMINUMCASE METERS

AL-250

- Light weight reduces shipping, handling & setting costs.
- One-piece aluminum alloy pressure die-cast body... 5 psi working pressure.
- Molded, 3-convolution Duramic diaphragms for all fuel gas services.
- Modern design and attractive appearance insures customer acceptance.

American AL-250 Aluminumcase meter, rated at 250 cfh, operates at only 7 revolutions per cubic foot for sustained accuracy through greater power and slow-speed operation. Ideal for home heating and small commercial loads.

American 5B-225 Aluminumcase meter, rated at 225 cfh, operates at the conventional nine revolutions per cubic foot and is comparable with the standard 5B Ironcase meter... for most domestic services.

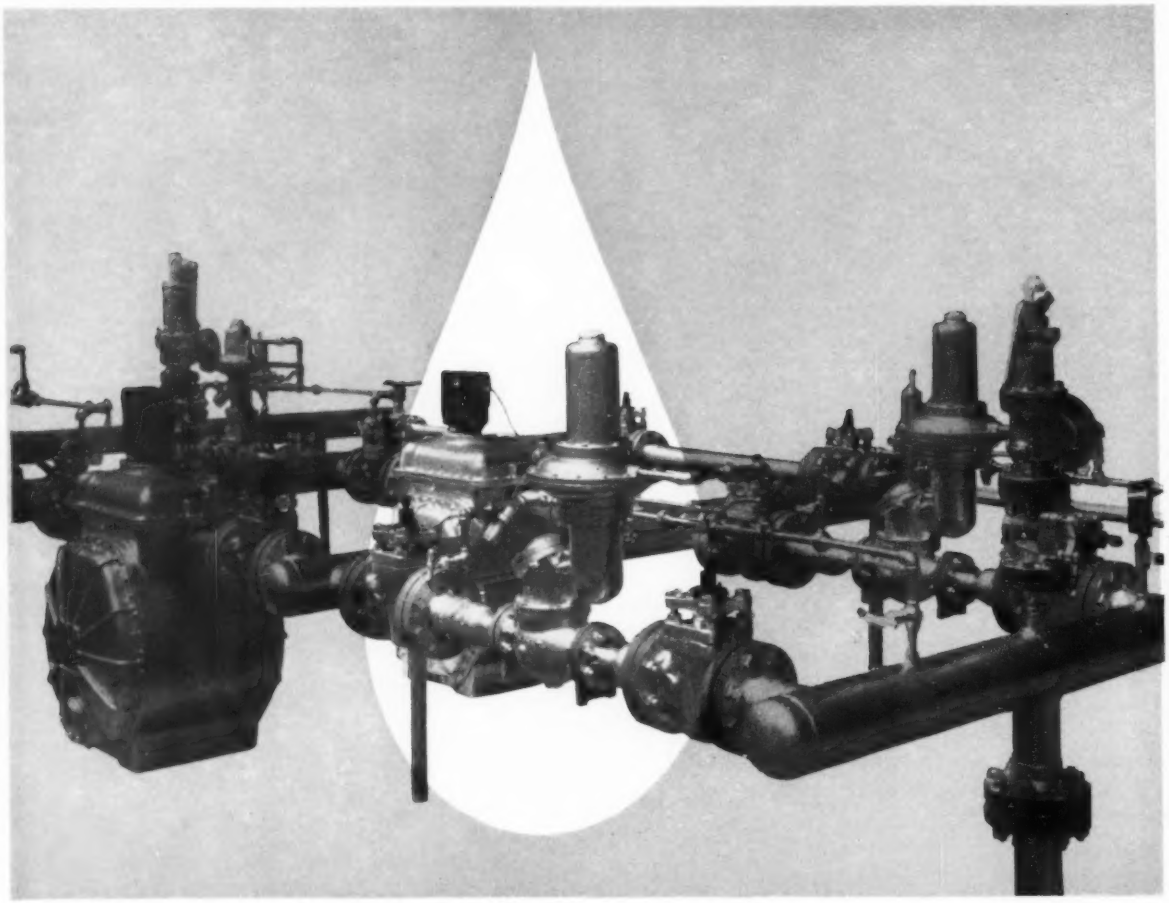
5B-225

AMERICAN METER CO. EST. 1836 MEASUREMENT ENGINEERS

AMERICAN® METER COMPANY

INCORPORATED (ESTABLISHED 1836)

SUPPLIERS TO THE GAS INDUSTRY for Ironcase, Tinned Steelcase, Aluminumcase and Welded Steelcase Meters • American-Westcott Orifice Meters • Instruments • Reliance Regulators • Apparatus • Valves



DEPENDABLE REGULATION WITH RELIANCE

ACCURATE MEASUREMENT WITH AMERICAN

Reliance CBV-201 high pressure, pounds-to-pounds regulators for economical first and second stage regulation on high pressure transmission and distribution systems. Rugged and dependable . . . for inlet pressures to 1200 psi and outlet pressures from 1 to 150 psi.

American 500B Ironcase Meters equipped with Base Volume Indexes accurately measure large gas volumes at standard conditions of pressure and temperature, as shown in the American installation above.

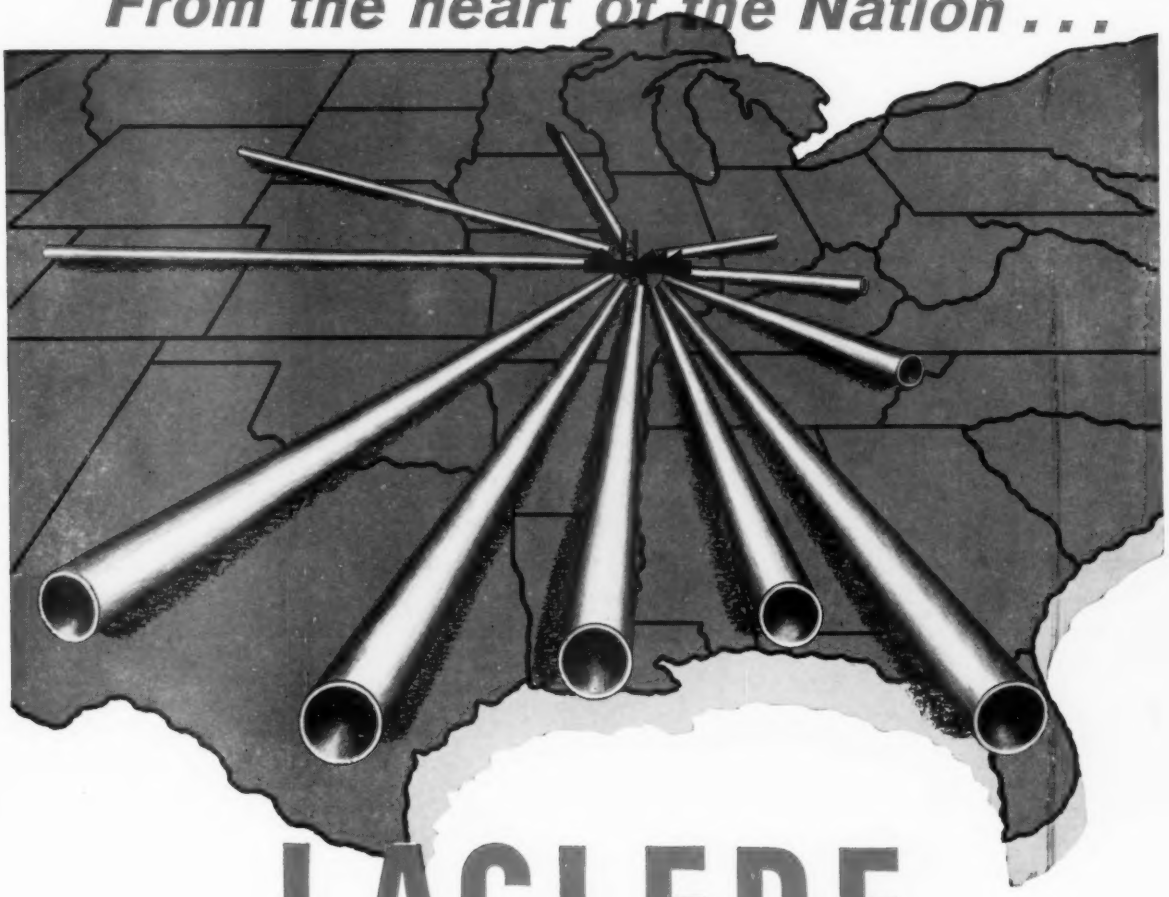
THE MOST ECONOMICAL—IN TERMS OF SERVICE! WRITE FOR BULLETINS CONTAINING COMPLETE INFORMATION

AMERICAN®
METER COMPANY
INCORPORATED (ESTABLISHED 1836)

AMERICAN METER CO MEASUREMENT ENGINEERS

RELIANCE
REGULATOR DIVISION
ALHAMBRA, CALIFORNIA

From the heart of the Nation . . .



LACLEDE

CONTINUOUS WELD STEEL PIPE

- From America's most modern continuous weld pipe mill
- Manufactured to all standard specifications
- Sizes up to 4", lengths up to 60'

ORDER FROM YOUR DISTRIBUTOR

LACLEDE

LACLEDE STEEL COMPANY

SAINT LOUIS, MISSOURI ◆ Producers of Steel for Industry and Construction

GAS

CONTENTS

APRIL 1959

35TH YEAR OF PUBLICATION VOLUME THIRTY-FIVE · NUMBER 4

FEATURES

GAS' 12th Annual Construction Budget Survey 49
1959—Biggest year of expansion for expansion-minded industry 50
Distribution budgets: $554,854,000 52
Transmission budgets: $1,317,571,000 54
1959 budgets of 220 gas companies 56
Production budgets: $182,929,000 62
Storage budgets: $102,831,000 63
General budgets: $83,009,000 64

How digital computer solves gas engineering problems 65
By Henry J. McCain Jr.

Overcoming coordinating problems in a radio system 68
By O. H. Johnson

Tape wrapping pipe fittings 72

Locating leaks on new main construction 75
By J. G. Sweeney

PIPELINE SECTION

Step toward automation 117
By Kenneth C. Yost

Evolution of the Vortex-Velocity gas meter 124
By Bruce J. Caldwell

DEPARTMENTS

Editorial Comment—

Thermally Thinking, *by J. Fred Ebdon* 6
Highlights 8
Regulatory & Legislative Trends 11
Technical Trends, *by Guy Corfield* 15
Washington, *by Neil Regeimbal* ... 17
Corrosion Prevention, *by Marshall Parker* .. 19
Communications, *by Frank Chapman* .. 140

News Developments—

Texas legislature gets utilities commission bill 78
Producer troubles blamed on depressed gas prices 78
Balance tipped against Transco-Con Edison deal 142
Coal interests win a point 148
Stay issued in allocation of Panhandle's gas ... 150

Departments—

Digest of New Products and Trade Literature 94
Associations 100
People 104
Calendar 109
Pipeline People 114
Advertisers Index 160

BPA

GAS is published monthly. Copyright 1959 by Chilton Company, 56th and Chestnut Streets, Philadelphia 39, Pa. Subscription price: United States and possessions and Canada (in advance): one year, $2.00; two years, $3.00. Mexico, South and Central America, Caribbean Area: one year, $3.00; two years, $5.00. All other countries: $10 per year.
Accepted as controlled circulation publication at Philadelphia, Pa. Members: Business Publications Audit of Circulation, Inc., National Business Publications, Inc. Gas is indexed regularly by Engineering Index Inc. The name "GAS" is registered U. S. Patent Office.

NBP

GEM OF THE OIL AND GAS INDUSTRY

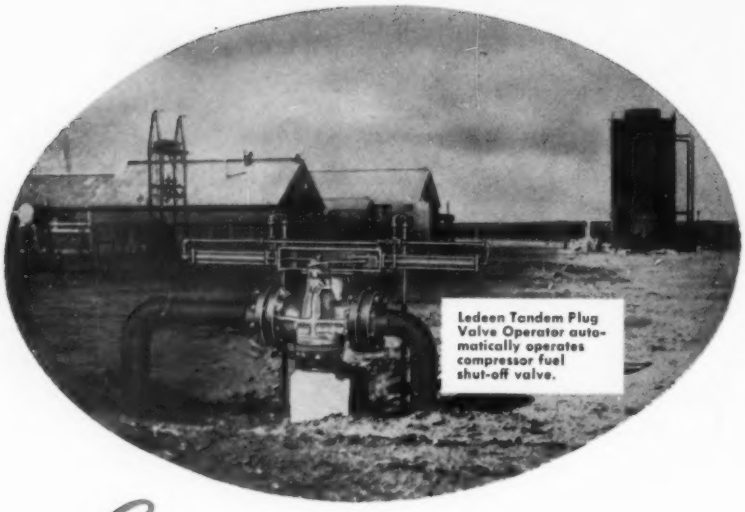
Lone Star Steel men are specialists . . true craftsmen. Lone Star is not just a steel plant *per se* . . but an organization of craftsmen specializing in fine pipe for the great and growing oil and gas industry.

At Lone Star . . with the finest tools and equipment . . steel craftsmen make API casing, tubing and line pipe to a precise quality level that is well known.

Lone Star pipe is the gem of the oil and gas industry.

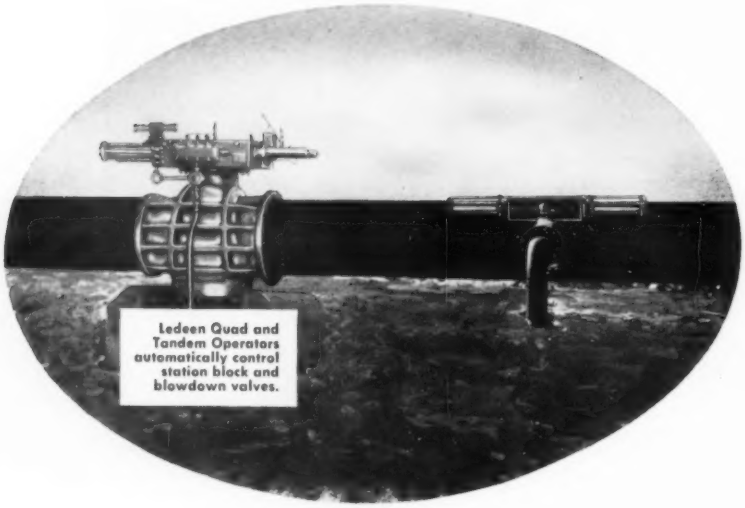
Lone Star STEEL COMPANY

EXECUTIVE—SALES OFFICES
W. Mockingbird Lane at Roper • P. O. Box 12226 • Dallas, Texas
DISTRICT SALES OFFICES
912 Republic National Bank Building, Dallas, Texas
Houston, Texas | Midland, Texas | Tulsa, Oklahoma



Ledeen VALVE OPERATORS

FOR THE GAS INDUSTRY



For automatic control of line valves, in typical installations as shown above, or for other applications in your own system, see Ledeen for one of the most complete lines of operators and controls available to the gas industry.

Whether you have gate valves or plug valves—1" to 36"—to equip for automatic control, write or call Ledeen for engineered recommendations.

Ledeen MFG. CO.

3334 No. Gilman Road, El Monte, California
CUmberland 3-3163
CANADIAN REPRESENTATIVES
Toronto: Ontor Ltd., 12 Leswyn Rd., Toronto 10.
Russell 1-5296.
Vancouver:
W. A. Akhurst Machinery Co., Ltd.
215 W. 2nd Ave., Vancouver 10. Emerald 4191.

WRITE FOR BULLETIN 3020

GAS

A CHILTON PUBLICATION

198 S. Alvarado St., Los Angeles 57

Tel. DUnkirk 7-4337

Frank Chapman, Publisher

J. Fred Ebdon, Editor

Don Wright, Managing Editor
William T. Harper, Eastern Editor
Barbara Hall, Assistant Editor

Guy Corfield, Technical Editor
Neil Regeimbal, Washington Editor
Raymond A. Grote, Art Director
Gerald N. Smith, Research
Robert Gunning, Readability Consultant

Gilbert Bowman, Promotion Manager
Mary Lou Dorian, Production Manager
M. A. Kesterson, Circulation Manager

ADVERTISING OFFICES

New York (17)
Joseph R. Geryk
100 E. 42nd St.
OXford 7-3400

Cleveland (15)
Frank J. Enright
Richard Duffy
930 B. F. Keith Bldg.
1621 Euclid Ave.
SUperior 1-2860

Chicago (1)
Richard L. DeMuesy
360 N. Michigan Ave., Suite 418
RAndolph 6-2166

Dallas (6)
Harold E. Mott
189 Meadows Bldg.
EMerson 8-4751

San Francisco
Frank McKenzie
Merchandise Mart
1355 Market St.
UNderhill 1-9737

Los Angeles (57)
Jack Kay
198 S. Alvarado Street
DUnkirk 7-4337

JOS. C. HILDRETH, Board Chairman
G. C. BUZBY, President

Vice Presidents: P. M. Fahrendorf, Robert E. McKenna, Leonard V. Rowlands, George T. Hook. Treasurer, William H. Vallar. Directors: George T. Hook, Maurice E. Cox, Frank P. Tighe, Leonard V. Rowlands, Robert E. McKenna, Everitt B. Terhune, Jr., Russell W. Case, Jr., John C. Hildreth, Jr., Chas. A. S. Heinle, John H. Kofron.

Stanley Appleby, Comptroller

CAP FORGED STEEL

INSULATING UNION

GREATER SAFETY • FEWER REPLACEMENTS

ENGINEERED—TESTED—PERFORMANCE-PROVED

for gas service

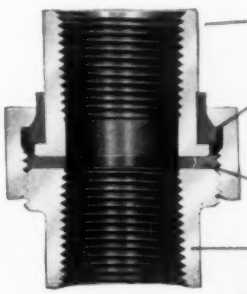
Each year, more corrosion engineers specify CAP Insulating Unions for their meter installations. These are necessary to assure maximum service from pipe and equipment. Insulating unions prevent corrosion caused by electrolysis.

Both the Capitol *Special* and *High Temperature* insulating unions are engineered specifically for gas service—performance-proved by years of service without a single failure—tested for assured quality control.

The *Special* insulating union is recommended for normal applications and will withstand up to 250° F (external heat). The *High Temperature* insulating union will withstand 450° F for one hour (the temperature at which solder in the meter will melt). The *High Temperature* union is designed for maximum protection against a gas leak in the event of a fire.

Only CAP gas service insulating unions have all of these features:

- Forged Steel construction—eliminates danger of sand holes or porosity.
- Exclusive Heavy Tapered Insulation—make connections 3-times stronger than light square type.
- Color Coded—for easy identification by service crews . . . orange for *Special* . . . yellow for *High Temperature*.
- Black oxide coated to prevent rusting.
- Two-thirds insulating unions, *Special* and *High Temperature* are available.



ALL FORGED STEEL for maximum tensile strength—no porosity—no sand holes.

TAPERED INSULATION assures 3-times stronger connections than light square type.

INSULATING is tested and proved effective, long-lasting.

NATIONAL PIPE TAPER for tighter joints.

Add to the life of your company's piping and meters by using CAP Insulating Unions on all installations.

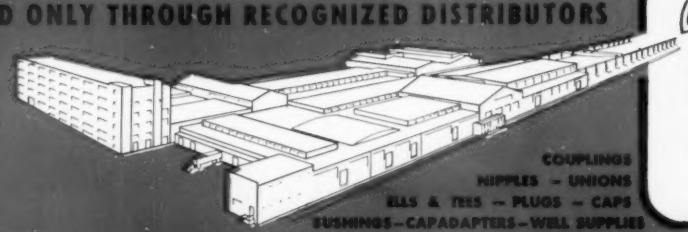
CAP *Special* and *High Temperature* Insulating Unions

Size	Overall Dimensions	Special Part No.	High Temp. Part No.	Quantity in Carton	Approx. wt. per 100
¾"	2.27"	GS-33	GHT-3	20	72#
1"	2.89"	GS-44	GHT-4	12	110#
1¼"	2.96"	GS-55	GHT-5	10	150#
1½"	3.07"	GS-66	GHT-6	5	220#
2"	3.48"	GS-77	GHT-7	5	340#

CARTONED:

Packaged in small cartons for easier handling, better protection, save time and reduce inventory losses.

SOLD ONLY THROUGH RECOGNIZED DISTRIBUTORS



COUPLINGS
NIPPLES — UNIONS
ELLS & TEES — PLUGS — CAPS
BUSHINGS—CAPADAPTERS—WELL SUPPLIES

CAP CAPITOL

MANUFACTURING CO.
DIVISION OF HARSCO CORP.
COLUMBUS, OHIO

GAS

APRIL 1959

Thermally Thinking

EACH year about this time, GAS winds up a statistical whing-ding that produces a survey of planned expenditures among hundreds of operating gas companies in the U. S. and Canada. You can find our 12th Annual Survey of Gas Company Construction Budgets in this issue. You can find our managing editor, Don Wright, in a quiet spot not far from our Alvarado Street headquarters nursing the adding-machine battered fingers of his right hand with a soothing tonic.

Don's fingers should, indeed, be somewhat sore. His trusty (we all hope) digits played symphonies on the mentioned device. The final chorus revealed that North American gas companies have budgeted over $2 billion for reinforcement and expansion during 1959.

Now, that much money is too much for an editor who can just manage to stay half a jump ahead of the Diners' Club to comprehend. But I would like to kick it around for a while—or as others might say, interpret.

Consider if you will that back in 1908 the sages of several industries were marking rapid reductions in electric power costs with observations that domestic use of gas would soon fade out of the picture. They reasoned that since old Ridiculous Reddy would soon be available so economically, people would not care to use gas in their homes.

Ah, how wrong they were. They were just about as wrong as anyone today who thinks anybody can balance the budget (or much of anything else) in this pseudo-welfare state of our nation. But to return to my thought, early managements did not entertain this verbal demise of the gas industry. They pranced around Wall Street, raised money to invest in gas operations, and year after year kept plowing money into new gas producing plants and distribution systems. The industry took its lumps, of course, but it also kept going and kept after old Reddy pretty well at the same time.

Management has to have vision. It needed it in years past to bring the gas industry to its modern state, it needs it now to prepare for 50 years hence. I will say that management is the key to the future, while operating people are the key to success in the present.

That is my theory, for what it is worth. It is based on personal observation that a few gas companies I have visited have key people in the management level who would be right at home down in the inbred-cousin belt. Yet, their systems were operated very well by their dedicated operating people in the field. Such companies are in not too bad shape at the present time, but 10 or 20 years from now—look out.

Certainly current gas distribution and pipeline companies have management with vision. If not, they would not have had the courage in view of the state of this nation and its economy to put some $2 billion on the line for construction during 1959. What worries me, however, is the internal development of new management within gas companies.

The basic idea is that I see gas company executives filling top management posts who are in most cases past the bloom of youth. Below them I see a distinct gap. The gap is not so much in age as it is in position and responsibility.

To me, there doesn't seem to be enough of what I guess one can call "junior management." These are the fellows that will take the helm of the company after present management personnel have taken to the Florida sun or added to the smog of California.

The people who should have supervised management tasks right now to prepare them for the future are in your company. Perhaps they even have a title that is impressive (to anyone except an editor), but the work they do and the responsibilities they have place them in the captain-of-a-rowboat group.

You don't get corporate vision by being held down; you get it by being brought up at the right time. Current managements in the gas industry who will bring people along through "junior management," or "middle management," or "management training," or whatever you want to call it, will stay ahead of the game of corporate life. Others will become static gas companies and continue to let modern technique and technology pass them by. How will your company make out?

J. Fred Ebsen

EDITOR

7 TIMES LIGHTER

HANDLEY-BROWN CURB BOXES

Models with or without stationary rods.

PAT. APPLIED FOR

In Gas Service Equipment, H-B *engineering* makes the big difference...

End call-backs with attractive H-B outside meter boxes. Available as shown, or for recessed installation. Made of tough resin-rubber compound*.

Service Test Station. Provides a test station for leak surveys. Permanently installed. Makes random probing unnecessary. Made of tough resin-rubber compound*. Main test station also available.

H-B Cathodic Terminal Box. Landscape engineered, and non-corroding*. Leads are attached to the terminal block in the cap for easy testing.

Master Poly-Trol *automatic* gas shut-off valve. Shuts-off gas in event of overpressure, underpressure, excessive high temperature, and flooding. Serves also as a tamper-proof manual shut-off.

NON-CORRODING TOUGH and EASY-TO-FIND

Handley-Brown curb boxes are 7 times lighter than cast iron. Fabricated from a resin-rubber compound*, they are non-corroding. Built to last a lifetime. The easy-telescoping section prevents damage to service stop and piping.

They're easier to find, too. Permanent, built-in magnets with aluminum plates make these boxes easy to locate with either magnetic or electronic finders. Another plus feature . . . the high arch design of the base gives good clearance for curb stops, and allows ample room for foot piece.

Roadway Valve boxes* also available.

FOR COMPLETE INFORMATION MAIL COUPON

*A. B. S. Polymer

HANDLEY-BROWN CO.

BROOKLYN ROAD · JACKSON, MICHIGAN

"H-B engineering makes the big difference"

HANDLEY-BROWN CO., 2102 Brooklyn Rd., Jackson, Michigan

Gentlemen: ☐ I am interested in the Handley-Brown line of gas service equipment. Please send your complete catalog.

☐ Please have your representative phone for an appointment.

Name _____ *Title* _____

Company Name _____

City _____ *Zone* _____ *State* _____

GAS HIGHLIGHTS

Big expansion for gas industry

The gas industry is in the midst of its biggest year of expansion ever, according to results of GAS' 12th Annual Survey of Gas Industry Construction Projects. This year 220 companies report they'll spend $2,241,-194,000 on new construction, a new all-time high.

Pipelines lead the way

A total of $1.3 billion will be spent in '59 on new transmission facilities, the GAS survey shows. This, too, is a record high. Next comes new distribution system construction, with $554.8 million budgeted. Then, in order: production, $182.9 million; storage, $102.8 million; general, $83 million. For the complete results, see pages 49-64 in this issue.

Italy seeks natural gas

A test well is being punched down in Italy's Umbria province in an attempt to bring in natural gas. Test hole was started in late January near the town of Gubbio in central Italy. Natural gas is badly needed for industrial uses in the region. Drilling project is backed by Italian government.

Mrs. America will carry on

The Mrs. America contest will not die as a gas industry promotion this year, after all. Whirlpool Corp. has become the venture's major sponsor, and Hansell Hillyer, Inc., a new organization formed by the chairman of the board of South Atlantic Gas Co. (Savannah, Ga.), has been given the job of securing enough gas company participation to make the contest go. Finals will be held in Ft. Lauderdale, Fla., between June 11 and 23. AGA gave up its part in the Mrs. America promotion this year, after five years with it.

Depletion battle rages in Kansas

Battle rages between major gas pipeline companies and oil producers in Kansas over pending legislation that would okay rapid depletion of natural gas reserves in Kansas-Hugoton field. Bill's backers want to deplete the field in 20 years, saying gas and oil reserves there are draining into Oklahoma. They also charge pipelines oppose rapid depletion because they are actually using the field for storage. Cities Service Gas Co., one of the pipelines involved, counters, saying it is actually preserving Kansas gas for use in Kansas, and doesn't want to deplete the state's reserves by piping gas to eastern markets.

NIG steps up storage injection

Northern Illinois Gas Co. has injected the billionth cu ft of natural gas into its new underground aquifer storage reservoir near Troy Grove, Ill. NIG hopes to have 5 billion cu ft stored in the reservoir by year's end, is optimistic over chances storage project will be ready for initial operation for winter of 1960-61.

More underground storage for Laclede?

St. Louis' Laclede Gas Co. is now drilling test holes on what might prove to be an underground storage pool near Columbia, Mo. Geologist reports on the structure have been favorable, so has the first test hole. Three more tests are now in progress. If it works out, storage field would be used to bolster company's peak day capacity for St. Louis.

Harris gives up on gas bill

Rep. Oren Harris (D.-Ark.) has thrown in the towel on his natural gas bill. He says there appears to be little chance that it would receive Congressional approval this session. Harris, chairman of the House Commerce committee, said he dooesn't plan to hold any hearings on the bill "unless conditions change."

Muni ownership threatens Florida

Proponents of municipal gas systems are making loud noises in Florida. In St. Augustine, a municipal group is seeking to take over the distribution system of South Atlantic Gas Co., which, naturally, is opposed. And, in Leesburg, a new municipal system is ready to be built. Reason for the sudden surge of interest—the Houston-Coastal pipeline will start delivering natural gas in Florida in June.

"I bought another Sherman Digger because . . .

. . . competition is rough! To protect my business, I've got to have fast, maneuverable and trouble-free rigs that out-perform anyone else's. That's why I own two Sherman Power Diggers now and why, at one time or another, I have owned six Shermans. Performance is a must in my work—I get it with Sherman!"

CARL DIEM
Diem Septic Tank Installers, Flint, Mich.

Sherman units purchased from Otto P. Graff Tractor Sales, Flint, Michigan

Write for Bulletin No. 490

SHERMAN S PRODUCTS

POWER DIGGERS • LOADERS • SOIL WORKING TOOLS • FORK LIFTS
CRANES and EXCAVATORS • FOUR-WHEEL DRIVES

SHERMAN PRODUCTS, INC., Royal Oak, Michigan

YOU SELL MORE BECAUSE...
YOU HAVE MORE TO SELL

WITH THE JOHN WOOD FULL LINE

plus

GLASSLINER

IT'S NOT TALL —IT'S
NOT SHORT
IT'S NOT FAT
IT'S NOT THIN

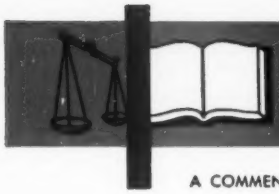
IT'S JUST RIGHT!

AMERICA'S MOST BEAUTIFUL COMPETITIVELY PRICED WATER HEATER

Look over them all. GLASSLINER stands out ahead in sales appeal. Exclusive new cast iron burner permits the low silhouette, Glasslined and galvanized in 20, 30 and 40 gallon models.

JOHN WOOD COMPANY
Heater and Tank Division
Conshohocken, Pennsylvania • Chicago, Illinois

QUALITY PRODUCTS JOHN WOOD SINCE 1867



Regulatory and Legislative Trends

A COMMENTARY ON NATIONAL AND STATE DEVELOPMENTS BY AN EXPERT IN UTILITY LAW

Penalty for poor service

THE Louisiana commission penalized a utility for rendering poor service by denying the entire amount of a justified rate increase of about $2 million a year. The commission's startling finding made late in 1958 was that "Since April 1957, the company has rendered grossly inadequate service to its Louisiana subscribers and has arbitrarily curtailed a necessary expansion program in this state, thereby failing to perform its obligation as a public utility to such an extent as to require this commission to deny to the company the increase to which it would otherwise be entitled."

That is severe regulatory treatment, especially when it requires good earnings to be able to render good service.

• Consumers benefit from a utility's financial vitality

A regulatory commission has a duty to encourage good utility service as well as to prescribe reasonable rates. To provide prompt, adequate, and dependable service a utility must be financially strong. Financial strength is required to insure the confidence of investors in the basic earning capacity of the capital that is already invested in the utility, and to attract the necessary amount of new capital, on reasonable terms, to provide for additions and replacements of facilities.

A utility is in competition for the investors' money with other utilities and nonregulated businesses having comparable risks. The objectives are that investors will retain the utility securities they now own; they will make purchases in the market of securities between new issues; and they will buy large blocks promptly when new securities are offered. To develop financial vitality, therefore, a utility must pay a competitive return on its bonds and stocks. To enable a utility to pay competitive returns on the investment, it is essential that the regulatory commission authorize it to charge compensatory rates for service.

There is, of course, no guaranty of a fair return—but only a guaranty of an *opportunity* to earn adequate compensation — an elementary distinction, but one commonly overlooked. The compensation which the Constitution guarantees this opportunity to earn must be sufficient to reimburse the utility for operating expenses, depreciation, and taxes, plus a fair return. A fair return, being the wages paid for the use of invested capital, is just as much a part of the cost of rendering services as wages for labor. The utility's return to be considered fair must meet the contracted financial requirements of its bonds and preferred stock, and the economic obligation to pay competitive dividends on the common stock while retaining some earnings in the business.

• Louisiana's penalty for inadequate service

Rate-making involves the balancing of the interests of both utility consumers and investors, but Louisiana recently balanced the scales against the investors. To inform gas company managements about what can happen when a regulatory commission deals in heat rather than light, let us examine the reasons given. The following reasons of the Louisiana commission are plausible, but not persuasive. The commission asserted:

". . . the company would normally be entitled to increase its intrastate rates by amounts sufficient to produce additional gross operating revenues of $1,918,707. However, Southern Bell's record of performance since the last rate order makes it impossible for us to grant such an increase. At least since April 1957 the company has utterly failed to meet its obligation of rendering adequate service to its subscribers in the State of Louisiana. This has been largely due, by its own admission, to the abandonment of numerous initiated projects and the refusal to undertake any substantial new construction program.

"Louisiana being one of the fastest growing states in the nation, the need for additional telephone facilities is particularly acute. The company does not deny this extraordinary, and immediate, need for improved and expanded service, but, on the contrary, concedes that innumerable requests for up-grading and for new telephone facilities have been denied." * * *

"The company readily admits that it has deliberately curtailed its expansion program. The company had indicated, for example, that the estimated necessary gross construction program for 1957 was $43,860,000 but that it proposed to build only $29,855,000; for 1958 it estimated necessary construction at $48,900,000 but it proposed to build only $14,224,000 and for 1959 it estimated necessary construction at $46,480,000 but proposed to build only $14,500,000. The only excuse offered for such curtailment is that the rates fixed by us in the previous

case were inadequate. In view of the fact that the order fixing those rates was unanimously approved by the Supreme Court of Louisiana, such arbitrary action borders on contempt. In any event, this commission cannot condone the company's violation of its public obligation on such grounds.

"That failure to render reasonably adequate service authorizes a regulatory commission to deny an otherwise meritorious application for rate increase is well established. For instance, the Oklahoma Corporation Commission in *Re Western Light & Telephone Company* (1957), 17 PUR 3d 422, denied a similar application for telephone rate increase on this ground saying (at 428):

> 'We feel that the quality of utility service is an important consideration in determining a fair rate of return; and, that failure to maintain a telephone plant in a high state of efficiency and to make additions and betterments to the extent necessary to keep pace with the modern standards of service results in subscribers receiving inadequate and unsatisfactory service, and companies providing such service should not expect a rate of return which would compensate them at the same rate of return as is allowed companies which maintain a good standard of service.'

"The Indiana commission has followed the same rule: 'It appears to the commission from the evidence that the service rendered by the petitioner in the Winslow exchange area has not been reasonably adequate, and further, that the petitioner should not be allowed to increase rates and charges in said exchange area until such time that such service is made reasonably adequate, and the same should be inspected by the engineering department of this commission and certified to this commission by the engineering department prior to any increase in rates in the Winslow area.' *Re Midwest Telephone Co., Inc.*, (1958) 23 PUR 3d 26, 31, 32.

"Likewise the Wisconsin commission:

> 'We feel that the telephone subscribers should not be expected to pay the increased rates if adequate and satisfactory service is not supplied by the company and that the increase should be contingent upon submission of proof by the company that it has made the necessary replacements and improvements to supply satisfactory service consistent with the standard established by the commission.' *Re Hudson Prairie Telephone Co.*, (1939) 29 PUR (NS) 232."

* * *

"It is no answer to say that higher rates must be granted in order to furnish the necessary revenues for improved service. The rule, even for small utilities, is that reasonable service must precede the rate increase. As the Missouri commission said in *Gooch v. Doniphan Telephone Company* (1952), 91 PUR (NS) 212:

> 'His (the utility owners) proposition that he first must have a rate increase to give him borrowing power to raise the money with which to improve his plant, cannot be entertained. To say the least, the suggestion is most unusual. Under the law, it is the duty of the utility to furnish the plant and the duty of this commission to allow a reasonable return on the investment and to allow rates which will produce the same. Mr. Rice should know this. He must perform his duty without any advance guaranty of increased rates from this commission and it is his duty to maintain an ability to raise the funds requisite to perform his profession of service.' * * *

"It is for these reasons that we must deny the increase in gross operating revenues of $1,918,707 which we would otherwise be inclined to allow.

"Nevertheless, at such time as the company can offer satisfactory proof that it is rendering adequate service to its Louisiana subscribers and has undertaken such an improvement and expansion program as will keep pace with the growing demand for telephone facilities in this state, this commission will entertain an application to place in effect increased rates sufficient to produce the additional revenues found warranted in this opinion. Lest we be misunderstood, however, we deem it proper to expressly state that we are *not* inviting a wholly or partly new application for increased rates based on a new test period and new proofs. A very extended hearing has been had; the most recent data available even beyond the test period, has been examined; the evidence has been weighed with great care; and we have been at pains to formulate detailed findings. All this was done with the object of fixing the rates of the applicant for the future. While, of course, no rates are permanent, nevertheless, they should remain in effect for a reasonable period. Thus, though it may be a considerable time before Southern Bell can present to us the proofs necessary to put into effect the rates found reasonable in this opinion, we must discourage any attempt to re-open the investigation on the merits in connection with the application we have reserved the company the right to file."

The Louisiana commission criticized the utility for protesting against the inadequate rates fixed in a prior case. The commission pointed to a Supreme Court approval for vindication, but there is a big difference here. A court tests the end result of a rate established by a regulatory commission to see whether it confiscates the property. The standard of return necessary to pass the test of confiscation is lower than the return which a commission should fix as just and reasonable. ■

reaching

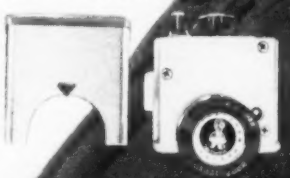
for new eye-deas to sell more water heaters?

....change to

ROBERTSHAW UNITROLS

with built-in gas pressure regulators

The Robertshaw Unitrol 200R with built-in gas pressure regulator offers you an eye-catching, eye-appealing new way to increase your water heater's appearance... rating ... reliability! Give your water heater the modern, smooth look... convenient new "slip-top" cover slips off in a second to give easy access for pilot lighting. This exciting new feature with its clean design, no sharp corners, eliminates dust catching, dirt marks... provides a concealed control without recessing... makes all previous controls obsolete! Make your water heater the apple of every eye with an attractive new Robertshaw Unitrol 200R!

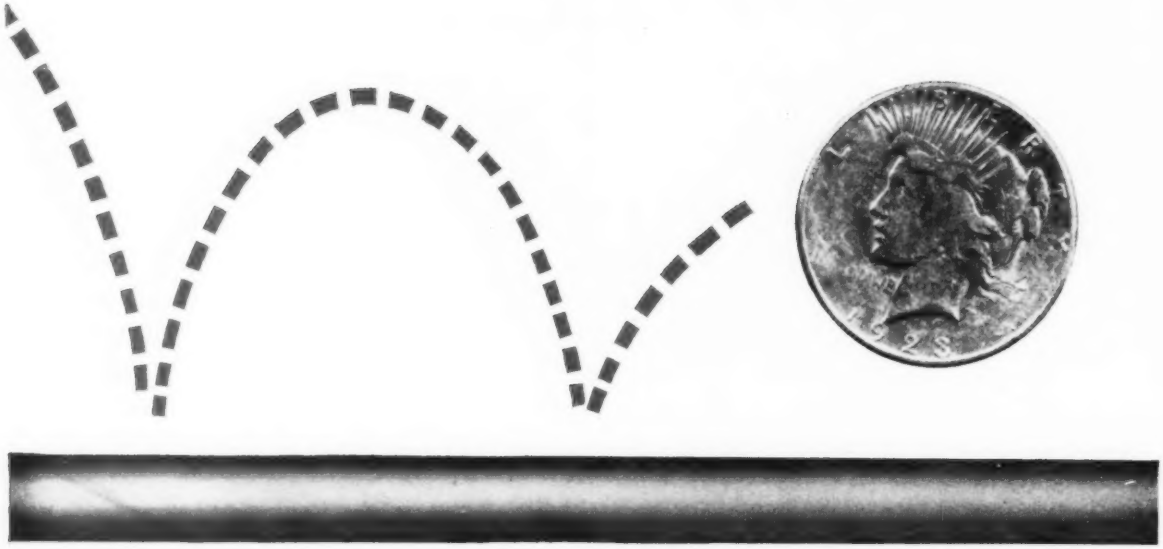


New "slip-top" cover conceals knobs... reduces tampering.

FOR MORE INFORMATION, CONTACT: Robertshaw

GRAYSON CONTROLS DIVISION • LONG BEACH, CALIFORNIA

TEX-TUBE lightwall pipe makes your pipeline dollar go farther



Take strength. Tensile strengths and working pressures of Tex-Tube Lightwall Pipe equal those of standard weight pipe of the same I.D.

Consider corrosion. If pipe wrap and cathodic protection are doing their job, why do you need a heavy wall?

In short, why buy "protection" you can't use? It's costing you plenty.

No wonder the trend is to money-saving, fully-proven Tex-Tube Lightwall Pipe.

TEX-TUBE, INC.

1503 NORTH POST OAK ROAD • HOUSTON, TEXAS

Sales Offices in Midland, Texas—Tulsa, Oklahoma—Baton Rouge, Louisiana—Los Angeles, California

LICENSED BY THE AMERICAN PETROLEUM INSTITUTE

TECHNICAL TRENDS

By GUY CORFIELD

Controlled explosions put to work

In a recent issue of this page (March 1959) an article entitled "In-Situ Combustion for Oil Recovery" mentioned the possible use of underground nuclear blasts for petroleum or shale oil production. The shattering effect of the blast, plus the heat, would release the oil and make it fluid so that it could be forced to the surface. It was also mentioned that government restrictions motivated by the current international ban on further nuclear tests have so far prevented experimentation.

It appears, however, that the scheme is at least continuing to receive serious attention. On Jan. 6 and 7 oil and petrochemical industry representatives were invited to meet with scientists of the Atomic Energy Commission and the Bureau of Mines to consider experiments in the shale oil area near Rifle, Colo. The government technicians, using information gathered in five recent underground nuclear tests in Nevada, have calculated that a 10 kiloton explosion, which could be released safely at a depth of about 500 ft, would free about 15,000 bbl of oil and 10 MMcf of gas. A one megaton blast, at 3000-ft depth, would be expected to release 30 million bbl of oil. Actual production would require drilled holes to penetrate the shattered area, and in-situ combustion for continued heating and movement of the oil. Radioactivity would be sealed harmlessly in fused rock at the point of the explosion.

It was proposed that AEC and B of M spend $1 million to provide and fire the nuclear device, and the oil industry contribute an initial $500,000, which would cover preparation of the site, and probably an approximately equal sum later for the production of the oil and gas. Oil industry reaction was apparently mixed. There was definite interest, but reluctance to gamble this much money without more proof that there was possibility of success. Fear was expressed that the underground formation would not be fractured into small enough pieces to permit oil release. It was decided that all parties would consider the proposal further, and also an alternate one that a smaller and less expensive preliminary test be made.

Beyond this, the Nevada underground tests have opened up the possibilities of using the enormous power of nuclear explosions for large scale mining, creation of harbors, leveling of mountains, etc. There is even thought being given to using the heat of an underground nuclear blast to develop steam for surface utilization, or to produce useful chemicals by conversion of underground salt, sulfur, limestone, etc.

Coming to more simple and immediate applications, there has recently been considerable study of small scale demolition operations using TNT. An investigation by Stanford Research Institute, for the U. S. Army Engineers' Research and Development Laboratories, led to new formulas and techniques for cutting steel, blasting concrete and breaking up wood. By proper application of a suitable size and shape of explosive charge steel plates, girders, pipes, rods, etc., can be cut; plain or reinforced concrete can be demolished; wooden beams or timbers can be felled with even directional control. This, of course, could have civilian and gas industry applications for demolition of old structures, clearing rights-of-way, etc.

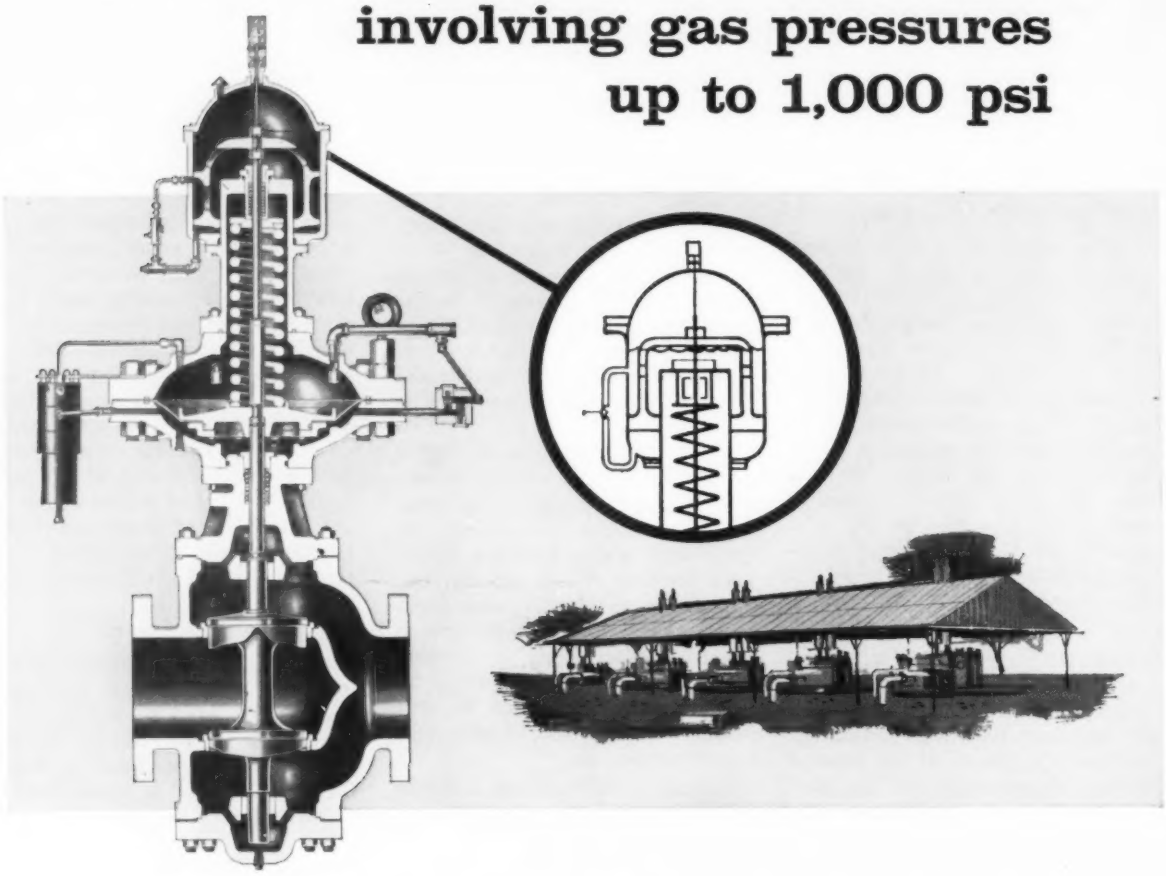
Still another use for controlled explosions is to shape or form metals, using the power of the explosion instead of a mechanical or hydraulic press. By a suitable arrangement, for instance, a dynamite explosion, either directly or with the force transmitted through water, slams a sheet of metal against a die. It is reported that pressures of 7 mililon psi can be developed. Also that the metal can be stretched or drawn farther than by a conventional press because it doesn't have time to crack. The technique is particularly useful for shaping tough and heat-resistant metals. It is also economical when only a few shapes have to be formed, which otherwise would require the use of a large and expensive press. It is being employed at least experimentally by all the large aircraft and missile makers, and also by many small operators. It also appears to be limited only by the ingenuity of application.

Ultrasonic welding

One of the latest applications of ultrasonic vibration is to the joining or "welding" of metals. The welding "torch" is actually a tool which is caused to vibrate at high frequency by use of a transducer which converts electrical energy into mechanical vibration. The tool may be in the form of a tip for spot welding, or a wheel which can be rolled along to make a seam weld. It is believed that the union of the metal surfaces is due to the grinding action of the rapid vibration, which results in intimate contact and final union. The end result is said to be as strong and complete as a conventional weld.

So far the process has not much more than emerged from the laboratory, but it is being investigated with great interest for special purpose work, and equipment can be obtained on an individual design basis. Principal advantages claimed for it are no melting of the metal and therefore no change in structure; and no need for protective atmospheres, fluxes, etc. Soft aluminum and copper, ordinarily difficult to weld, can be readily united. So far only sheet-thicknesses can be joined but only one of the components need be thin, i. e., the process could be used to clad a heavy plate with a thin sheet of corrosion resistant metal.

Handles uncommonly rough jobs involving gas pressures up to 1,000 psi



Oil dash pot prevents inner valve "jump"

When the gas industry needs a regulator that can withstand the dynamic forces of large flows and high velocities, it turns to the Fisher Type 885-1. Here's the ideal high pressure gas regulator for the difficult reducing jobs on transmission lines and large town border stations. The inner valve is dampened and cushioned by a special oil dash pot. The inner valve jumping sometimes encountered in high capacity, high pressure systems is eliminated. For further information about the Fisher Type 885-1, send for Bulletin P880-A.

FISHER
TYPE
885-1

IF IT FLOWS THROUGH PIPE ANYWHERE IN THE WORLD . . . CHANCES ARE IT'S CONTROLLED BY

FISHER GOVERNOR COMPANY

Marshalltown, Iowa / Woodstock, Ontario / London, England

FISHER® Controls
SINCE 1880

WASHINGTON

By NEIL REGEIMBAL
GAS Washington Bureau

Depletion allowance safe for another year

THE present gas and oil depletion rate—the highest of any industry and an important factor in gas supplies and prices—is safe for this year.

Unless the Harris natural gas bill passes by some legislative fluke, the present 27½ per cent gas depletion rate will not be tampered with this year.

This is the cloakroom report from top congressional leaders. They indicate privately that gas industry backers and opponents have in effect reached a tacit agreement to leave the industry alone for this year.

This is an important stalemate to distributors and pipelines as well as gas producers. Any cut in the depletion rate of more than a few points would inevitably lead to higher prices for gas, which could seriously impair the fuel's ability to compete with oil, coal, and electricity.

There is a sizable group of lawmakers, particularly in the Senate, who are frothing in their red hot zeal to whack 10 percentage points or so off the oil and gas depletion rate.

But they'll be stymied. House leaders particularly are dead set against permitting a showdown this year on the depletion rate.

This is due in part to Rep. Harris' power in the lower chamber as head of the Commerce Committee, which is the starting point for natural gas legislation and also for a wide range of matters affecting every industry and every section of the country.

It's also due to the determination of Rep. Wilbur Mills, also an Arkansas Democrat, not to permit votes on any major tax bills this year. He is chairman of the House Ways and Means Committee, the source of all tax legislation.

Next year, however, the situation will probably be exactly reversed.

Rep. Mills, as things now stand, plans to have a far-reaching tax reform bill ready in 1960. When this measure leaves his committee, it will undoubtedly not call for any cuts in the gas and oil depletion rate. But once it hits the Senate floor where members can pick it apart, there's a chance that cuts will come.

Congressional nose-counters now figure that some 43 or more senators would be likely to vote for a cut in the rate. This is almost 50 per cent of the 98-vote Senate, and normally is more than enough to win any vote because a full complement of senators is rarely on hand at any one time.

In the House, backers of the depletion rate figure they'll be in just as bad shape.

It appears now that the industry's best hope of saving the present depletion rate in election-year 1960 is for a presidential veto. But because legislation cutting the rate will undoubtedly be only one part of a far larger tax measure, this too is a dim prospect. The President must turn down an entire measure in order to kill any part. Lawmakers frequently insert some action that he opposes into a measure he favors and thus force his approval.

The President has asked Congress to pass legislation giving him the power to veto a single item in certain types of legislation, but the lawmakers have balked because it would reduce their power.

The Administration is still opposing any cut in the depletion rate unless it follows a detailed congressional study. Treasury Secretary Robert Anderson has several times this year been asked by gas industry opponents to defend the rate. He has done so, although not particularly energetically.

His standard reply is that the present rate is working out "pretty well" because new discoveries are about keeping pace with increasing demand and use. He also repeatedly insists that if the depletion allowance is put under study, all commodities should be included.

A budding congressional spending spree is another force adding to the likelihood that the depletion rate will be pared next year. The lawmakers are — as expected — ignoring the President's suggested spending ceilings in his precariously balanced $77 billion budget.

Higher appropriations for many programs, particularly defense, are a certainty. At the same time, the lawmakers are balking at Ike's requests for some higher government revenues from boosts in the gasoline tax and postage rates.

About a year from now, these same lawmakers are going to be faced with a deficit of several billion dollars in the fiscal year beginning next July 1 on top of a $12 billion shortage in the current year. When they start scrounging around for some method of raising extra money, the $390 million a year that a cut in the depletion rate to 15 per cent would allegedly produce is going to be pretty at-

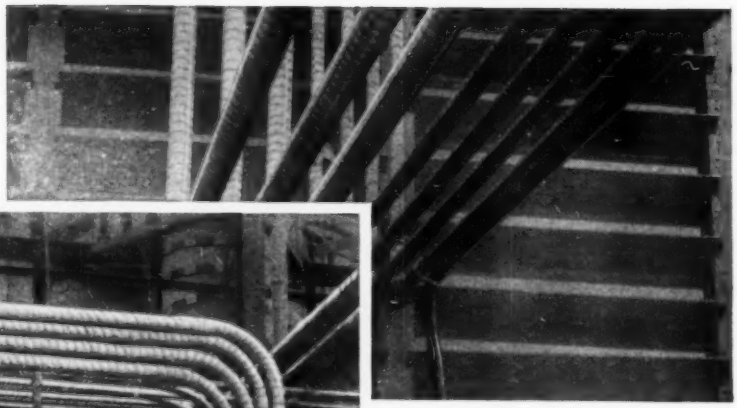
Continued on page 88

THE MODERN TOOL... AT WORK FOR MODERN INDUSTRY

to stop corrosion

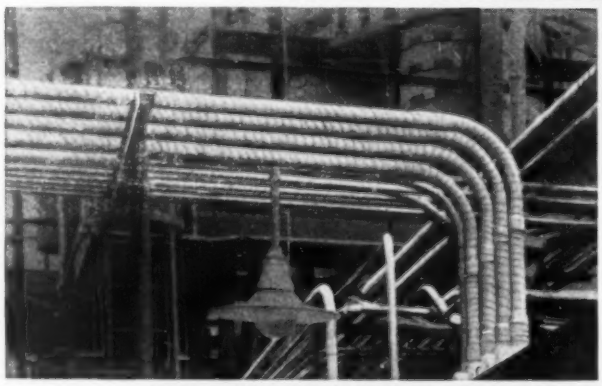
here

Polyken Protective Tape Coating is tough and long-lasting . . . that's why maintenance men prefer it to costly repainting.



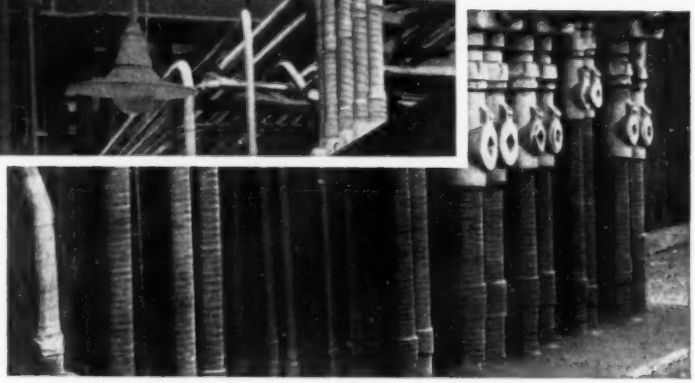
or here

Polyken is polyethylene tape coating . . . elastic, inert, nondrying . . . offering stable protection under severe chemical conditions.



or here

Polyken's doubly thick adhesive system holds tight . . . seals voids . . . bonds to clean surfaces without a primer.



start here

(contact your local Polyken distributor)

Atlanta, Georgia: Steele & Associates, Inc.

Chicago, Illinois: Sales Engineering Inc.

Cincinnati, Ohio: Hare Equipment

Cleveland, Ohio: The Harco Corp.

Denver, Colorado: Patterson Supply

Des Moines, Iowa: Donald Corporation

Fort Worth, Texas: Plastic Engineering & Sales Corp.

Harvey, La.: Allen Cathodic Protection Company, Inc.

Houston, Texas: Cathodic Protection Service

Kansas City, Missouri: Industrial Coatings Engineering Co.

Long Beach, Calif.: Barnes & Delaney

Minneapolis, Minn.: Simcoe Equipment Co.

Philadelphia, Pa.: Harold N. Davis Co.

Plainfield, New Jersey: Stuart Steel Protection Corp.

St. Louis, Missouri: Shutt Process Equipment Co.

San Francisco, Calif.: Incandescent Supply Co.

Seattle, Washington: Farwest Corrosion Control Corp.

Seattle, Washington: Pacific Water Works Supply Co.

Polyken®

Experienced in modern PROTECTIVE COATING

THE KENDALL COMPANY

Polyken Sales Division

By MARSHALL E. PARKER

Prediction of leak rates - part 4

TABLE 2 shows the values of the three derived functions, n/a, 1/a, and the complicated K, as described in the March 1959 issue. The scatter diagrams, with the regression lines, are shown in *Figs. 4, 5,* and *6*. The regression equation, with the values of r, are as follows:

TABLE 2

Soil No.	Resistivity ohm-cm	n/a	1/a	Log K
1	1,215	3.36	6.84	− 2.964
2	684	2.60	7.17	− 5.374
3	30,000	1.18	6.94	− 4.204
4	6,670	3.69	6.25	− 3.491
5	1,346	3.26	6.94	− 5.490
7	2,120	3.97	8.62	− 8.360
8	350	2.41	7.51	− 4.743
9	2,820	0.93	5.82	− 4.100
10	7,460	2.28	5.43	− 3.564
11	11,000	2.28	7.14	− 4.311
12	3,190	0.93	7.14	− 5.421
13	290	0.93	5.18	− 2.400
14	3,520	3.04	6.33	− 2.384
15	489	3.20	10.00	− 8.470
16	8,290	2.71	8.47	− 5.714
17	5,980	1.52	8.00	− 7.884
18	1,410	1.62	9.01	− 8.063
19	1,970	3.30	9.71	− 8.028
20	2,870	2.28	5.32	− 3.599
21	2,370	4.65	7.75	− 4.900
22	5,150	2.56	12.19	−10.857
23	278	4.39	7.19	− 2.222
24	11,400	0.64	5.82	− 5.835
25	1,780	3.18	11.36	−11.368
26	2,980	3.42	8.33	− 6.682
27	570	3.82	5.88	− 3.753
28	408	8.68	9.43	− 4.118
29	1,270	3.37	5.62	− 1.354
30	1,300	4.31	8.13	− 7.416
32	5,700	2.00	6.06	− 4.084
33	800	4.40	5.95	− 2.679
34	4,900	3.44	6.36	− 4.336
35	2,060	0.79	3.14	− 1.195
36	11,200	1.44	10.31	− 9.910
37	11,200	1.41	5.24	− 2.279
38	38,600	1.50	6.54	− 6.256
39	7,440	3.40	6.67	− 4.357
40	970	3.47	6.94	− 3.940
41	1,320	4.11	10.53	− 9.239
42	13,700	3.06	10.20	− 6.901
43	60	2.41	5.13	− 1.338
44	1,000	2.03	6.76	− 4.236
45	233	5.49	7.04	− 3.856
46	1,500	0.97	5.37	− 2.105
47	1,770	1.27	4.22	− 3.218

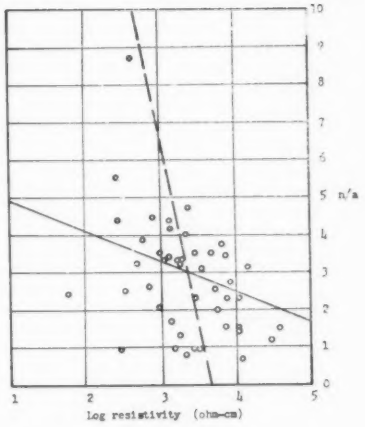


FIG. 4

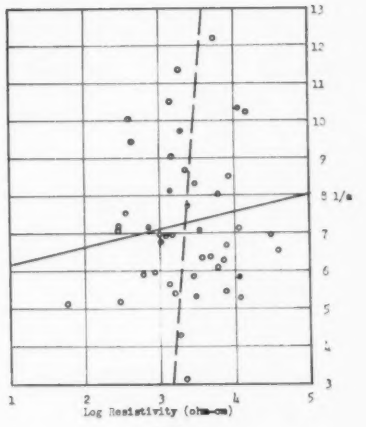


FIG. 5

$$n/a = 5.73 - 0.82 \text{ Log } \rho$$

$$\text{Log } \rho = 3.64 - 0.10\ n/a$$

$$r_{n/a} = 0.29$$

$$1/a = 5.64 + 0.48 \text{ Log}$$

$$\text{Log} = 3.02 + 0.044\ (1/a)$$

$$r_{1/a} = 0.15$$

$$\text{Log K} = 3.49 - 2.54 \text{ Log}$$

$$\text{Log} = 3.91 + 0.11 \text{ Log}$$

$$r_{\text{Log K}} = 0.55$$

It will be noted that the correlation of 1/a is little better than that of the original variable a. The value 0.15 is so small as to be of

Continued on page 100

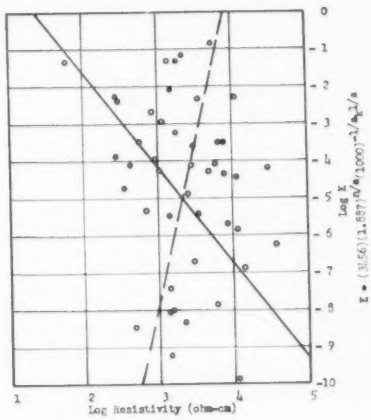


FIG. 6

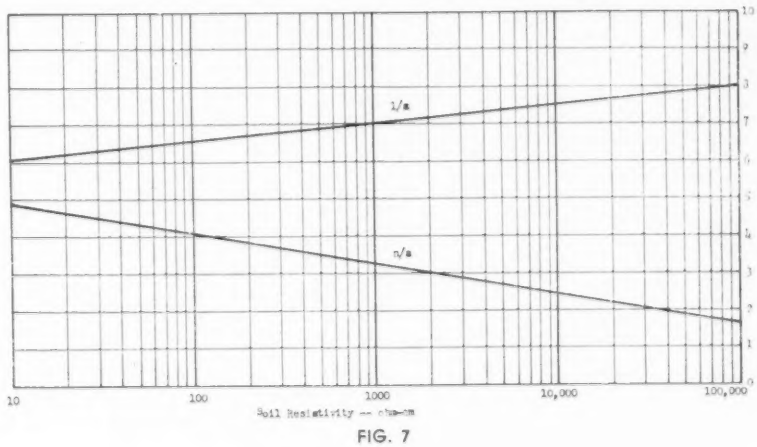
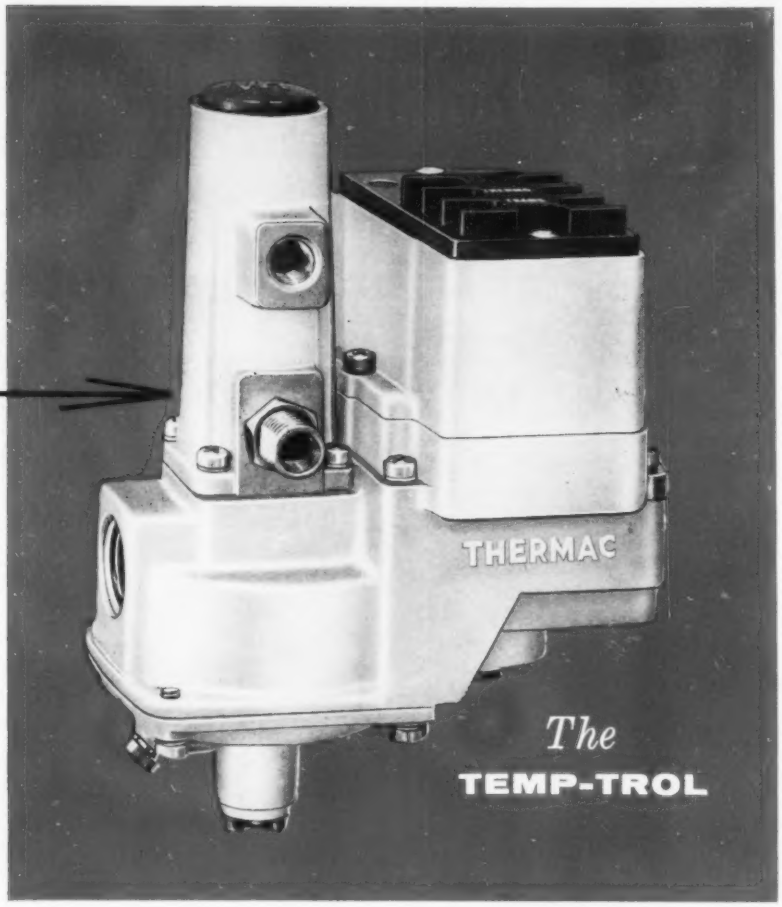


FIG. 7

At Last...



An Absolutely Quiet Control

THERMAC TEMP-TROL SLS 420 SERIES

Now, for the first time a truly silent automatic gas control. The new Thermac Delux "TEMP-TROL" . . . a dream come true in the gas industry . . . combines in one unit the regulator, safety and automatic main gas control valve with or without 100% pilot shutoff.

Absolutely quiet in operation because there is no action to create noise. Utilizes a revolutionary new principle of operation for the diaphragm type automatic gas control valve. A low voltage (25 Volt, Low Temperature) Stainless Steel Rod and Tube Thermo Element does the work. Accelerated cycle tests simulating many years of service prove the control dependable and trouble-free.

Now, you can offer the warm air trade this outstanding improvement in controls - a strong appliance selling feature, the TEMP-TROL by Thermac. Appliance manufacturers are urged to phone or write now for test samples.

Patent Pending

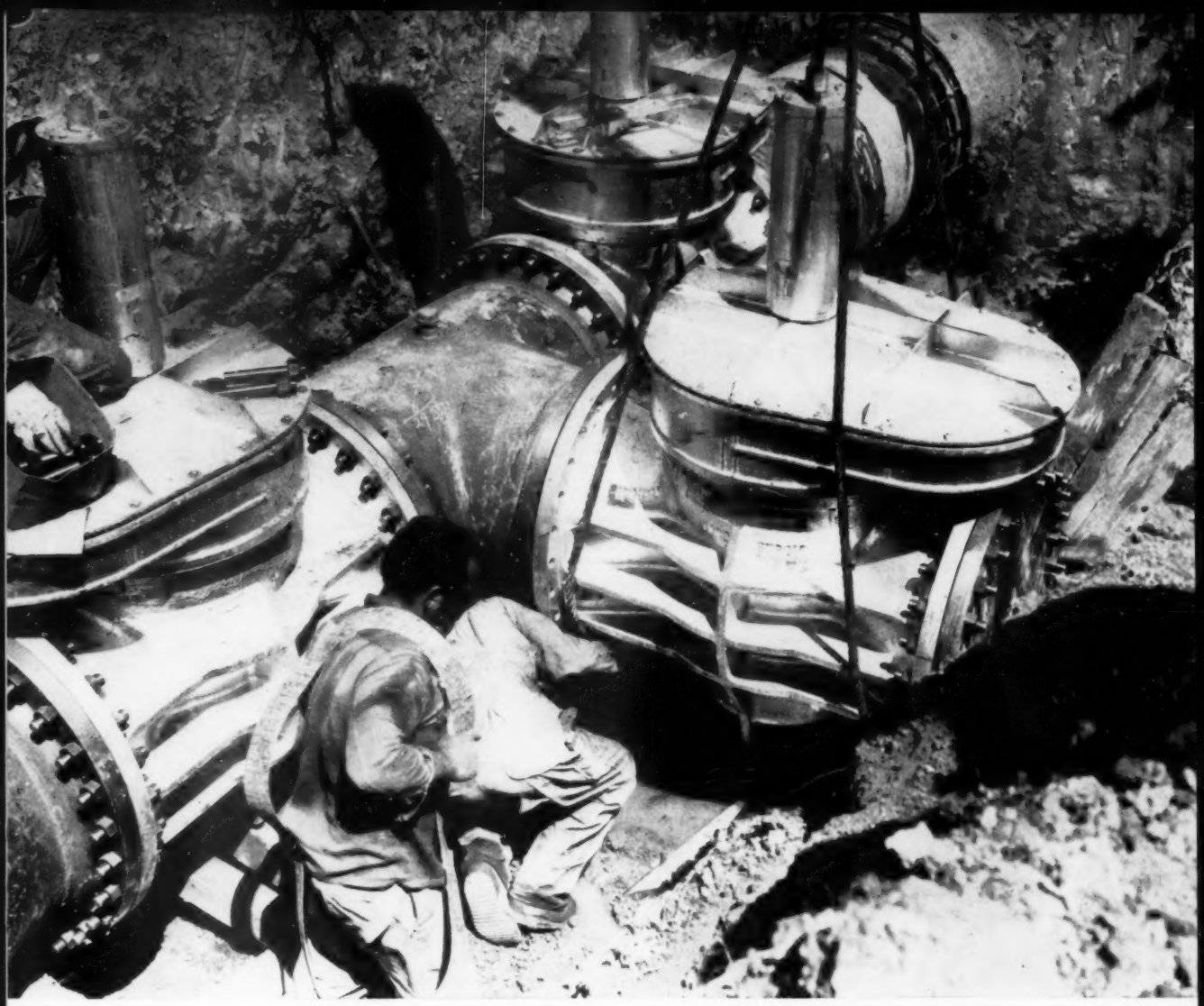
THERMAC
COMPANY

Certified by A.G.A.

"25 years' experience building gas controls"

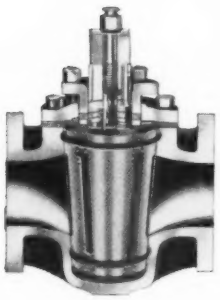
Distributed in Canada by Ontor, Limited.

14296 EAST SIXTH STREET • CORONA, CALIFORNIA • REdwood 7-3511



WHY IT PAYS TO START WITH

LUBRICATED PLUG VALVES



Lubrication: The Built-In Plus Value

Cutaway Rockwell-Nordstrom valve shows pressurized lubricant *Sealdport* system that prevents leakage, assures dependable operation.

For every gas industry operation from well-head to homes, Rockwell-Nordstrom valves are specified more than any other valve because their pressurized lubricant sealing assures positive shut-off . . . a gas industry "must." And gas men have learned to rely on the fact that lubricant is their assurance of fast, smooth operation every time. Another equally important benefit: lubrication stops metal-to-metal wear for *longer valve life at lower cost.*

Rockwell-Nordstrom is the original and world's most complete line of lubricated plug valves and plug valve accessories. For details, write: Rockwell Manufacturing Company, Pittsburgh 8, Pa. Canadian Valve Licensee: Peacock Brothers Limited.

ROCKWELL-Nordstrom VALVES

another fine product by

ROCKWELL

SAFELY stop-off 3″ and 4″ lines SIMPLY UNDER PRESSURE

MUELLER® NO-BLO® Method

Two new machines – the CH-6 Drilling Machine and the H-17246 Completion Machine – now offer another Mueller No-Blo method for stopping-off 3″ and 4″ lines under pressure.

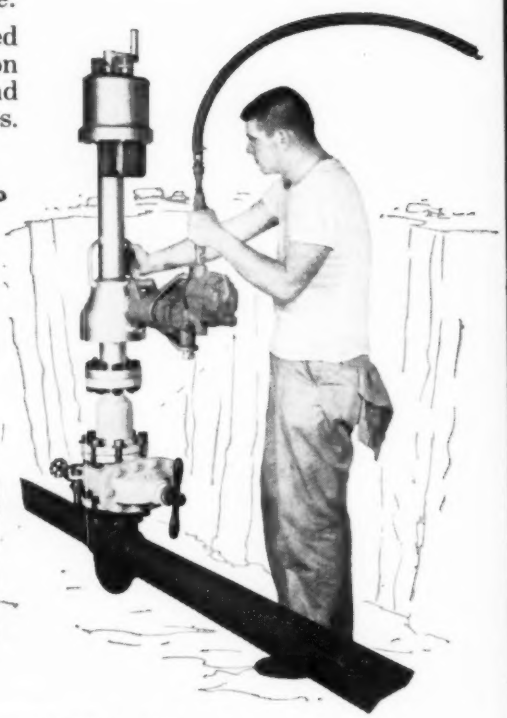
Here is shown the step-by-step method developed to stop-off a 4″ line in an all-welded, steel distribution system using a Mueller Line Stopper Fitting and these new machines.

STEP 1. WELD

Weld Line Stopper Fitting and Save-A-Valve Drilling Nipple to main. Test welds. Bolt special Mueller gate valve—hand tight—to fitting and open valve. Attach small gate valve to drilling nipple used for equalizing and purging connection.

STEP 2. ALIGN

Attach alignment tool and completion plug to shaft of new H-17246 Completion Machine. Bolt machine—hand tight—to valve. Align machine and valve with fitting and insert plug into fitting. Tighten bolts. Mark position of machine on valve. Remove completion plug and machine.

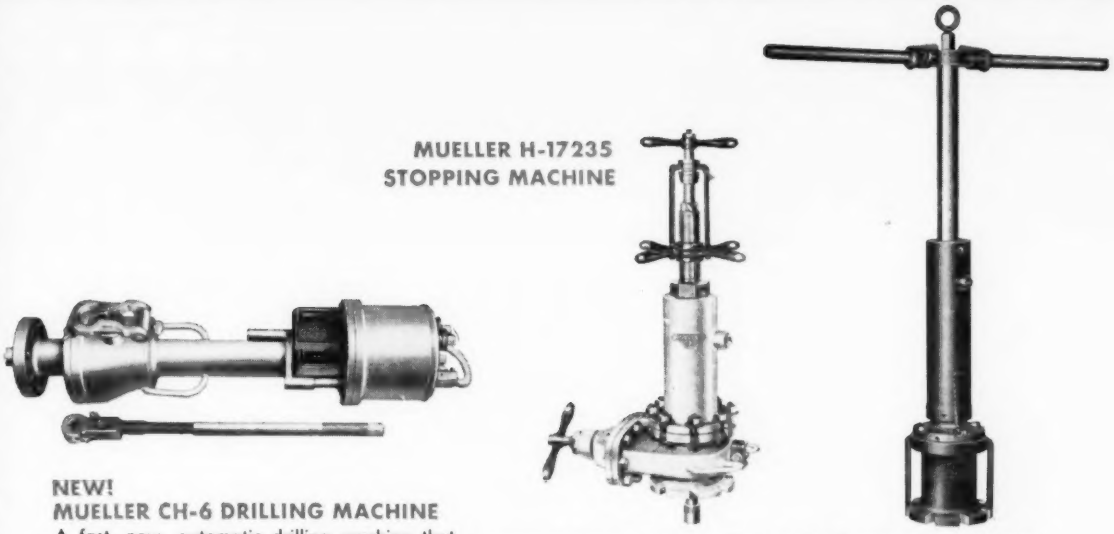


STEP 3. CUT

Bolt adapter to new CH-6 Drilling Machine and attach cutter arbor, pilot drill and shell cutter to boring bar. Bolt machine to valve, set amount of cut needed and engage automatic feed. Mount air motor on machine and open throttle. ("CH-6" will automatically make cut and disengage feed—without supervision). Retract boring bar, close valve and remove machine.

These new and greatly improved machines are typical of the constant attention to detail in research, design and engineering that becomes a part of all Mueller No-Blo fittings and equipment produced for the gas industry. Write for complete information today.

MUELLER H-17235
STOPPING MACHINE

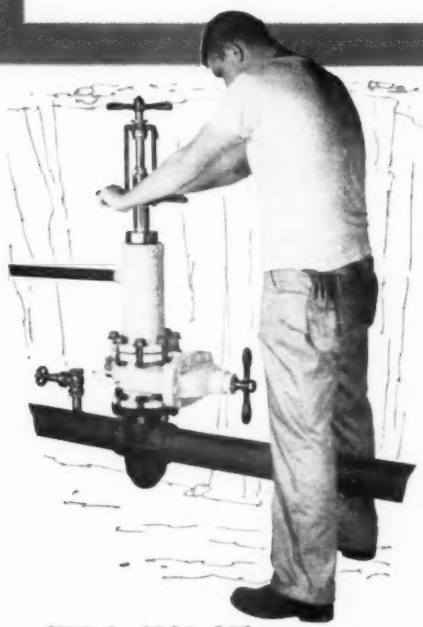


NEW!
MUELLER CH-6 DRILLING MACHINE

A fast, new, automatic drilling machine that greatly reduces the time needed to make the cut through the main. New design and new features make it simple and easy to operate and handle—even for inexperienced personnel. And automatic power cutting completely frees the operator from continually checking the machine during the cutting operation.

NEW! MUELLER H-17246 COMPLETION MACHINE

This new machine has just been added to Mueller's Line Stopper Unit No. 2. It is specifically designed for inserting and extracting 3" and 4" completion plugs—freeing the H-17235 Stopping Machines for stop-off work only. Balanced pressure design of the new "H-17246" equalizes line pressure within the machine. Shaft and plug are easily advanced and retracted without bucking full effective force of line pressure.

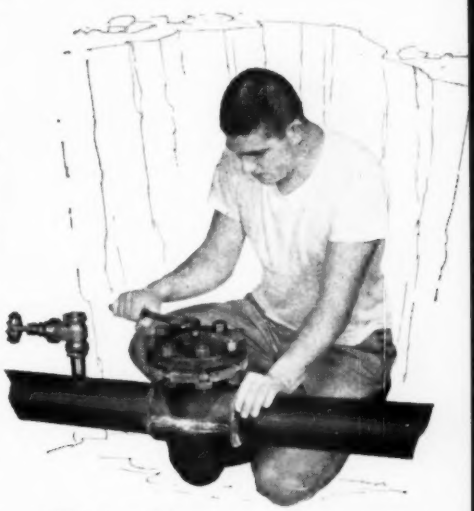


STEP 4. STOP-OFF

Attach stopper to shaft of H-17235 Stopping Machine and bolt machine to valve. Assemble by-pass and equalizing piping and place by-pass in operation. Open gate valve, lower stopper into fitting and expand. (If two fittings are used, a section of line may be completely isolated to permit tie-ins, relocations and repairs without interrupting service). Contract and raise stoppers, close valve and remove by-pass piping and machine.

STEP 5. PLUG

Fasten E-Z-Release inserting tool and completion plug to shaft of new "H-17246" and bolt machine to gate valve in same position as marked. Open valve and insert plug solidly into top of fitting. Test for tightness of plug. Release plug and remove machine and gate valve. Plug all drilling nipples with appropriate machine and remove gate valves.



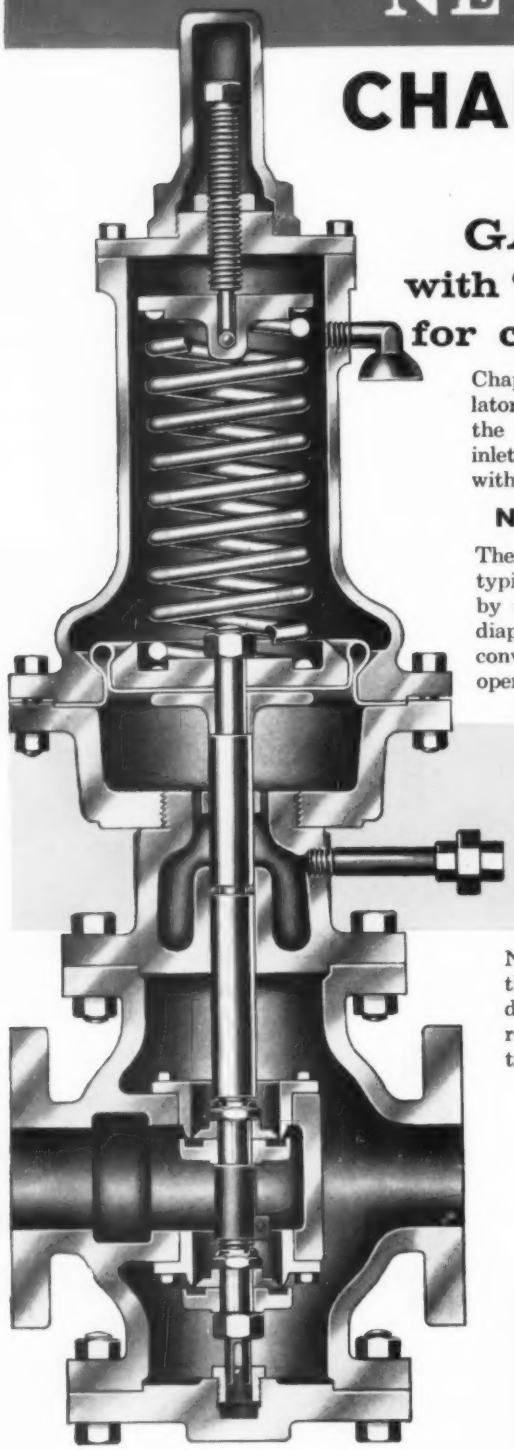
STEP 6. CAP

Position gasket on flange of fitting and bolt completion cap firmly in place. Tighten plugs and cap all drilling nipples. Test entire set-up with soapsuds. (Operation now completed and ready for backfilling.)

MUELLER CO. DECATUR, ILL.

Factories at Decatur, Chattanooga, Los Angeles;
In Canada Mueller, Limited, Sarnia, Ontario

NEW IN PRINCIPLE!
NEW IN DESIGN!



CHAPLIN-FULTON

Model 57-S

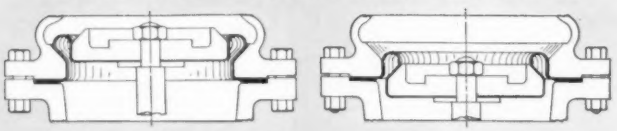
GAS REGULATOR
with "ROLL-OUT" Diaphragm
for constant pressure control

Chaplin-Fulton Model 57-S is a simple spring loaded regulator which performs like a pilot loaded regulator, without the added complications. For pounds-to-pounds service—inlet pressures to 400 psi—controlled pressures to 75 psi, with deviation through full valve travel less than 1 psi.

NO "FALL-OFF" AS FLOW INCREASES

The drooping characteristics or outlet pressure "fall-off", typical of conventional spring regulators, is eliminated—not by using an uncontrollable velocity effect—but by a new diaphragm design which actually reverses the action of a conventional diaphragm. It changes its area as the valve opens to compensate for the loss in spring loading force.

"ROLL-OUT" DIAPHRAGM PRINCIPLE



VALVE CLOSED VALVE OPEN

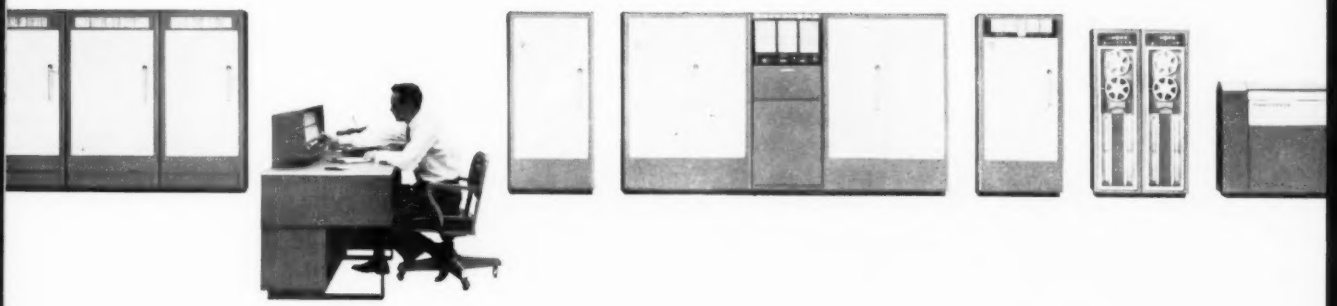
Note how, with the valve upwards in the closed position, the diaphragm achieves its maximum effective area—and decreases as the valve opens. The area changes at the same rate as the spring loses compression, to give a constant controlled pressure—determined entirely by valve movement.

2" - 3" - 4" - 6"
Write for Bulletin 57-S

ACCURATE CF MFG CO DEPENDABLE

Chaplin-Fulton
MANUFACTURING COMPANY
Pittsburgh 25, Pennsylvania

proven again and again: Burroughs 205 Computer



Designed to handle with ease a wide range of computational problems, the Burroughs 205 is delivering results daily in a great variety of scientific and business applications... from refinery design to inventory control, wind tunnel test analysis to insurance premium-billing, telemetered data reduction to operations research. The 205 was selected to work on these and countless other tasks because of its speed, 4080 words of memory, ease of program loading, vast magnetic tape storage capacity and multiple-card processing versatility... features which make the 205 today's best dollar-for-dollar computer value. The 205 is just one part of a complete line of Burroughs electronic data processing equipment, helping hundreds of industrial users to save precious man-hours and to solve important problems. Write for 205 brochure, ElectroData Division, Pasadena, California.

Burroughs Corporation

"NEW DIMENSIONS/in electronics and data processing systems"

If trouble-free service comes first with you...

. . . then cast iron pipe is first choice for your gas mains.

Cast iron pipe's record shows dozens of cases of more than 100 years' service—a claim unchallenged in the gas field. And improved, modern cast iron pipe assures you this same dependability for another 100 years.

Only Cast Iron Pipe gives you these outstanding features:

- √ Mechanical joints that stay tight through heavy top loads or washouts.
- √ Corrosion-resistant performance.
- √ Convenient lengths for easy installation, even in cramped quarters.
- √ Ruggedly constructed cast iron pipe resists a pressure of 9 tons per foot in 6-inch size, for instance.

...All good reasons for you to choose

CAST IRON PIPE

THE MARK OF THE 100-YEAR PIPE

Write for complete information to Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, 3440 Prudential Plaza, Chicago 1, Ill.

SPOTTY HEAT
The old fashioned wood or coal-burning stove generated plenty of heat but most of it was wasted . . . went straight up the flue. To keep warm, you kept close.

BASIC . . . but better than ever today

WARMTH WHEREVER YOU ARE . . . Thanks to modern gas distribution gas heat is evenly distributed, instantly available and responsive . . . comfort at the touch of a thermostat.

Two of the many features of cast iron pipe that make it ideal for expanding gas systems are its established quality and dependability. To provide both, U. S. Pipe controls every production step. From mining of raw materials to finished product, all U. S. Pipe is checked and rechecked for quality. This added care and precision in manufacture is one more reason for U. S. Pipe performance and dependability in service. Where it counts!

SERVICE IS BUILT INTO CAST IRON

- Standardized mechanical joints are bottle-tight for usual gas distribution pressures . . . and for all types of gas.
- Centrifugally cast pipe is tough, strong and uniform.
- Joint design allows for deflection during and after installation.
- Service connections are easily made.
- Long life a matter of record.
- No shortages. Cast Iron pipe is immediately available.

U.S. cast iron PIPE

U. S. PIPE AND FOUNDRY COMPANY
General Office: Birmingham 2, Alabama

GEM Sponsor

A WHOLLY INTEGRATED PRODUCER
FROM MINES AND BLAST FURNACES TO FINISHED PIPE.

Now there's a New "Jeweled" Escapement in ROCKWELL CHART DRIVES

for greater accuracy and longer life

This jeweled movement brings fine watch quality to instrument timing

SPEED CHANGING TURRETS PROVIDE SEVEN DIFFERENT ROTATION RATES

The basic Rockwell Chart Drive has a main arbor rotation rate of 7 days. Economical snap-on turrets permit changing to 8-day, 15-day, 16-day, 24-day, 30-day, 31-day, and 24-hour rotation. No tools or special skills are required. You can even change chart rotation without removing the drive from the instrument.

The introduction of a jeweled movement—the first ever used on a general industrial timing device made in the United States—makes the Rockwell more accurate than any unjeweled chart drive could possibly be. In addition to offering fine watch quality, the jeweled escapement requires less power to operate and is extremely durable, since seven hard jewel surfaces are provided to limit friction and wear.

You will benefit in many ways by using these jeweled movement chart drives for powering all your recording instruments. They adapt readily to fit into practically any instrument case while speed-changing turrets (see left) permit changing rotation rates at will. Write for full information. Rockwell Manufacturing Company, Instrument Division, Pittsburgh 8, Pa.

JEWELED CHART DRIVES

another fine product by

ROCKWELL

ROYAL PRECISION

Electronic digital computer solves distribution problems on networks of up to 1000 pipe sections and 400 loops by Hardy Cross method

Gives you optimum level efficiency in distribution, transmission, storage!

Operating from any convenient wall outlet, the compact, powerful LGP-30 is used at *desk-side* for the solution of such problems as network distribution, gas reservoir calculations for storage and production wells, high pressure gas transmission studies, mechanical design of pipelines and compressor stations. Result: you get the fast, accurate answers you need to insure peak operating efficiency. And at the lowest cost ever for a complete computer system!

Combining large memory (4096 words) and stored-program operation, the LGP-30 gives you twice the capacity of any computer in its class . . . is by far the easiest to program in basic machine language. Answers are printed out directly—require no deciphering. What's more, auxiliary high-speed input-output equipment is available for system expansion.

No expensive installation or air-conditioning required. Customer training is free. An extensive library of programs and sub-routines is available—as well as membership in an active users organization. Sales and service facilities are maintained coast-to-coast.

For further information and specifications, write Royal McBee Corporation, Data Processing Division, Port Chester, N. Y. In Canada: The McBee Company, Ltd., 179 Bartley Drive, Toronto 16.

ROYAL McBEE · *data processing division*

Naugatuck KRALASTIC

RUSTPROOF, CORROSIONPROOF, LIGHTWEIGHT, TOUGH, SNAKEABLE PLASTIC PIPE

and it joins with a brush!

No need for expensive threading operations and wrench work—no time wasted—Kralastic pipe can be joined in *seconds* by *anyone!*

Just paint mating surfaces of Kralastic pipe and fitting with a special solvent or cement—slip them together and allow them time to set, and you have made a connection as durable as the pipe itself!

And Kralastic *is* durable!

It can't rust or rot, is permanently free of electrolytic corrosion. It's unharmed by soil acids, natural gas, most chemicals. And because it's one of the toughest of all plastic materials, it resists damage from tools, rocks, and rough handling.

What's more, Kralastic pipe is flexible enough to follow uneven ground contours without costly, job-prolonging fittings. And it's easily cut with an ordinary hacksaw.

This tough rubber-resin material—one of the first to produce successful plastic pipe—has proved itself not only in natural gas lines, oil field pipe, and electrical conduit for home and industry, but in hundreds of other *tough* applications including water transmission lines.

Better investigate Kralastic® pipe and learn more of its *many* advantages. Write today to the address below.

United States Rubber

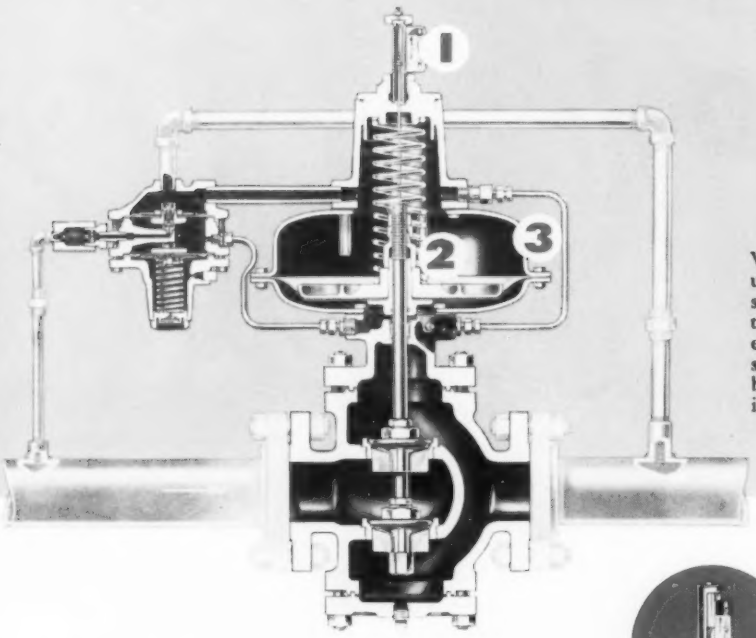
Naugatuck Chemical Division 414K Elm Street Naugatuck, Connecticut

Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices

DIST. OFFICES: Akron • Boston • Gastonia • Chicago • Los Angeles • Memphis • New York • Phila. • **CANADA:** Naugatuck Chemicals, Elmira, Ont. • **CABLE:** Rubexport, N.Y.

Important information about an

ULTRA SENSITIVE GAS REGULATOR



FISHER TYPE 298T

APPLICATIONS

While the Type 298T is most widely used as an intermediate or low pressure district regulator on gas distribution systems, it is equally effective in industrial applications such as heat treating furnaces, bakeries, boiler plants, and other installations.

SIZES AND PRESSURE RANGES

VALVES BODIES

- Double port "A" Body with metal to metal seats. Sizes—1" to 12"
- Double port "K" Body with "O" ring soft seat Sizes—2" to 12"

LOADING PILOTS

- Type 61H low pressure pilot Downstream pressure ranges—5" w.c. to 2 psi—2 to 10 psi—10 to 20 psi
- TYPE 61H High pressure pilot Downstream pressure ranges—10 to 65 psi
- TYPE 61HH Extra high pressure pilot Downstream pressure range—35 to 100 psi

MAXIMUM INLET PRESSURE

Valve Sizes 1 through 4"—up to 250 psi—6"—up to 200 psi—8"—up to 100 psi

FEATURES

1 Travel indicator shows valve position. No stuffing box—no friction causing seal! Enclosed in glass. Supplied as standard with no extra charge.

2 Specially constructed tapered locknut on rugged stem connection—no inner valve spinning under high gas flows.

3 Steel diaphragm casings of modern design for additional safety and adequate stroke for valves of all sizes.

If you want additional information about the FISHER Type 298T, write for Bulletin P-298C.

IF IT FLOWS THROUGH PIPE ANYWHERE IN THE WORLD...CHANCES ARE IT'S CONTROLLED BY...

FISHER GOVERNOR COMPANY

Coraopolis, Pa. / Woodstock, Ontario / London, England

Main Office and Plant: MARSHALLTOWN, IOWA

FISHER® Controls

SINCE 1880

POWERS American

SERIES LM-4

"Load-Master"

HYDRAULIC CRANE

Saves time and manpower because it speeds up loading and unloading jobs... handles work normally requiring several specially-equipped vehicles.

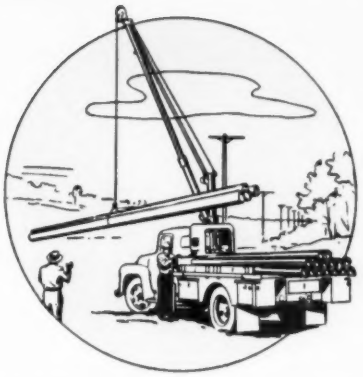
Load-Master lifts a 4000 lb. load with ease... moves it safely and quickly under the most adverse job conditions. Power is derived from a heavy-duty hydraulic pump driven by the truck engine. Controls are located in a position which gives operator full view of the crane at all times.

Operator has absolute control of load at all times. The hydraulic system requires intentional movement of control levers before load position can be changed... and the load cannot drop if the truck engine stalls.

OPERATING FEATURES: Telescopic-type hydraulic boom can be spotted at any point from horizontal position to an 85° angle of elevation; hydraulically-powered mast will turn 360° in either direction; specially-designed winch, driven by a hydraulic motor, is grooved to wind cable evenly; hydraulic outriggers, with swivel-mounted foot plates, furnish extra side stability.

Load-Master is ideally suited for use with the Powers-American Series 300 Body shown above. It can also be furnished with bodies of other types... or shipped for mounting in your shop or local garage.

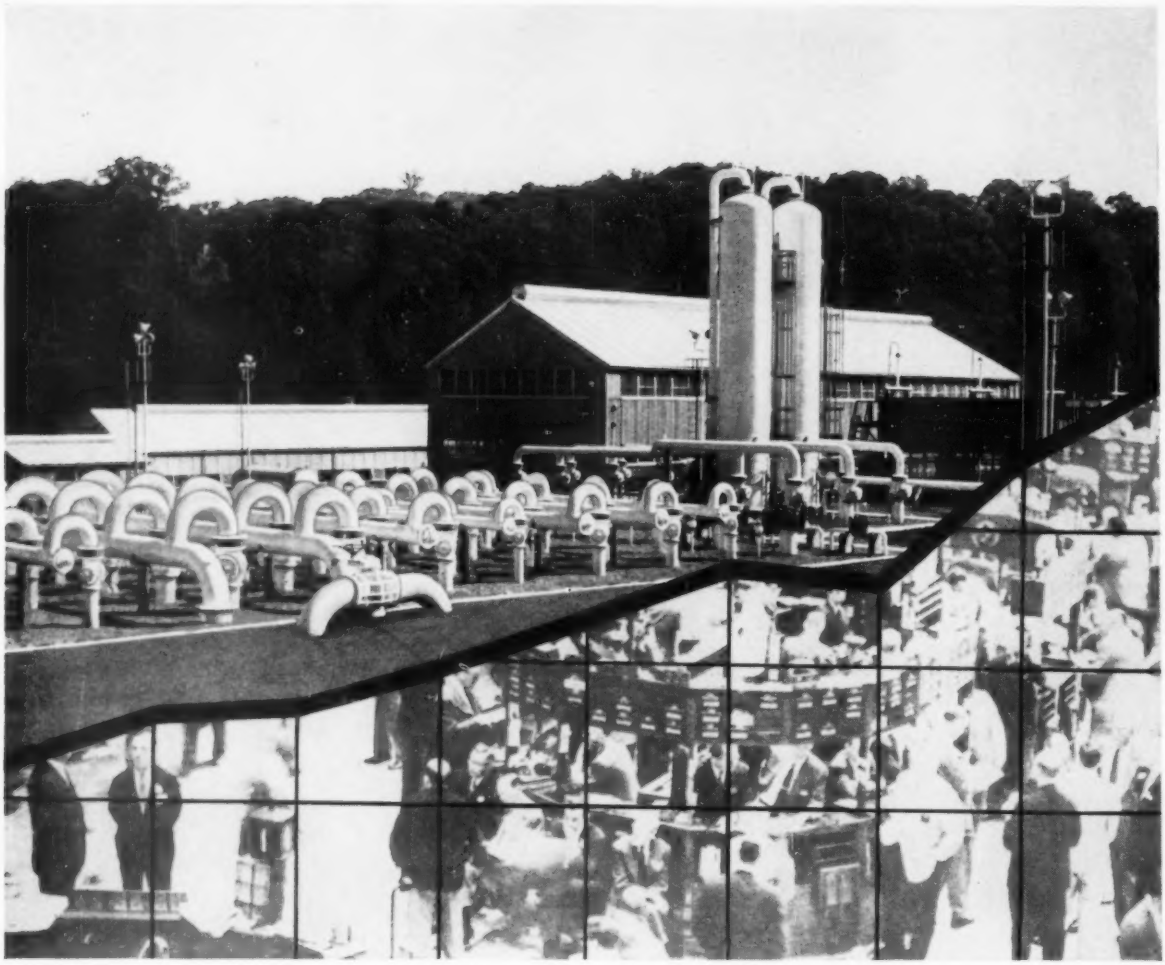
Price information and descriptive literature will be sent upon request.



Load-Master requires only 20" of mounting space behind truck cab. Boom extensions to 22' can be furnished.

McCABE-POWERS BODY COMPANY

5900 NO. BROADWAY, ST. LOUIS 15, MO. | 625 CEDAR STREET, BERKELEY 10, CALIF. | 5325 S. E. 28TH AVE., PORTLAND 2, ORE.



Compressor station squeezes gas handling costs through Pritchard's GOOD FINANCIAL DESIGN

The Majorsville Compressor Station recently built by J. F. Pritchard & Co. is part of a double-barreled solution to the problem of meeting peak demands for gas in the Pittsburgh area. Manufacturer's Light and Heat Company uses the new 5280 HP station in two ways: 1) to make the most economical use of pipeline capacity and 2) to reduce storage costs.

During off-peak periods, the station injects pipeline gas into depleted West Virginia gas wells which now serve as underground storage tanks. In this way, the company is able to take full advantage of off-peak rates. In the winter, the station withdraws the stock-piled gas and pumps it to customers.

Through Pritchard's emphasis on good financial design, the Majorsville Station has replaced an older compressor station at a cost permitting a reasonable return on the investment.

Compressor stations have long been a Pritchard specialty. In the last two years, Pritchard has installed over 130,000 HP on some 28 different jobs. On many of these installations, Pritchard did the entire job—design, engineering and construction. Other Pritchard services for the gas industry include dehydration plants, gas conditioning and treating plants, LP gas storage systems and peak shaving plants.

Pritchard's know-how and experience . . . Pritchard's emphasis on good financial design . . . are at your service.

Regardless of the size of your next job—if it's in the gas industry—it will pay you to talk to Pritchard.

PROFITABLE FACILITIES THROUGH GOOD FINANCIAL DESIGN

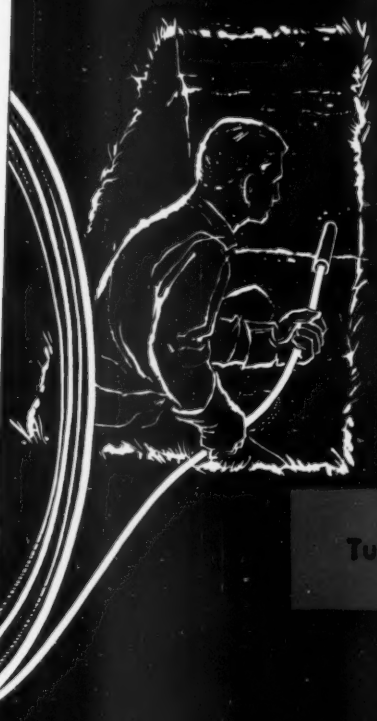
J. F. **Pritchard** & Co.

ENGINEERS • CONSTRUCTORS

Dept. 414, 4625 Roanoke Parkway, Kansas City 12, Mo.

OFFICES IN CHICAGO, HOUSTON, PITTSBURGH, NEW YORK

SERVING THE GAS, POWER, PETROLEUM AND CHEMICAL INDUSTRIES



Replace services without trenching

Tubing of Tenite Butyrate can be run through the metal pipe

Plastic tubing of Tenite Butyrate makes natural gas service replacements easier—and more economical. This tubing eliminates the need for trenching—the most expensive operation in service replacements. Only two holes need be dug: one near the gas main tap, the other at the service riser. Tubing of Tenite Butyrate is then run through the corroded metal service line. Since plastic creates less friction than metal due to the smoothness of its walls, pressure is unaffected by the slight decrease in diameter of the service line. Easy-to-use adaptors make connections between tubing and metal pipe.

Installation time is further cut because tubing of Tenite Butyrate is easy to handle. It is so light in weight that an average service of 70 feet weighs less than four pounds.

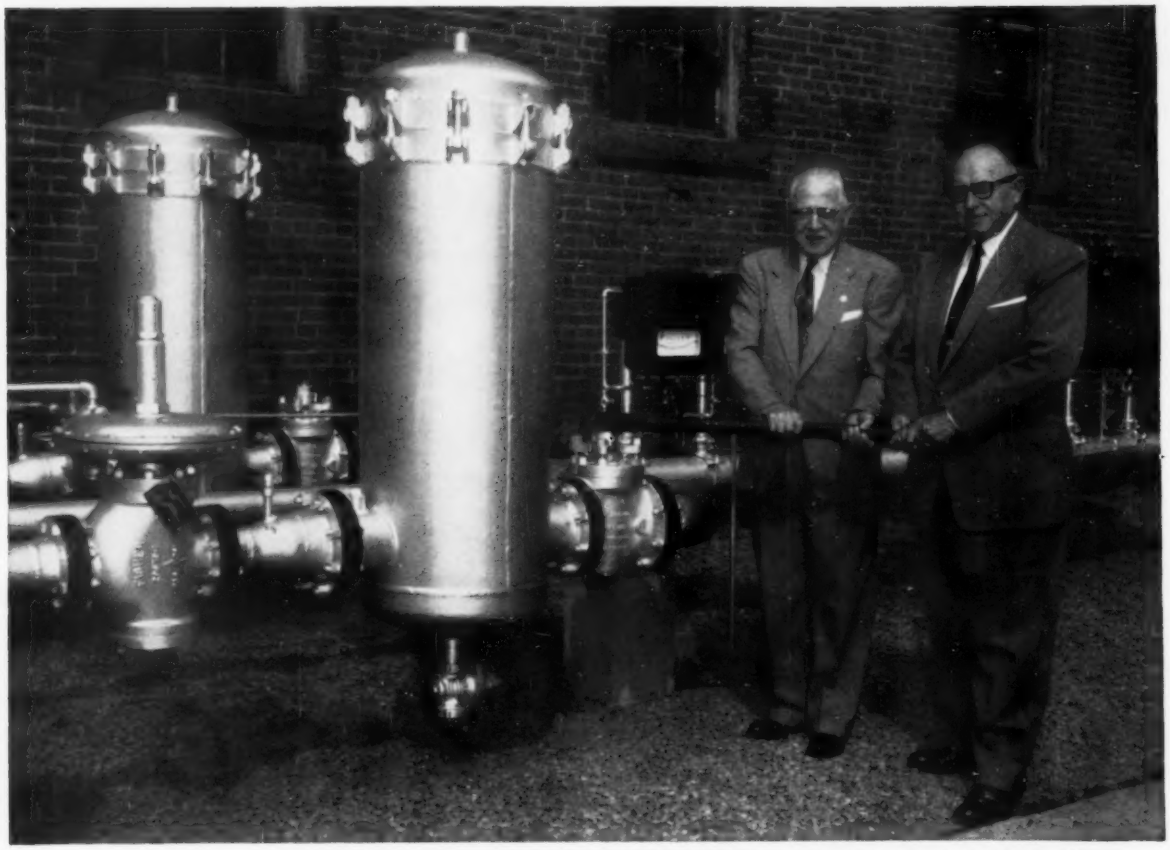
The economy does not stop with installation, however. Tubing made of Tenite Butyrate withstands soil corrosion or electrolysis—so you are assured of many years of trouble-free service.

Since 1943, extensive field use has demonstrated the many advantages of Tenite Butyrate over metal for natural gas service. One company has already installed nearly 3,000,000 feet of Butyrate tubing—for both new and replacement service lines.

Discover how you can share in the benefits offered by this Eastman plastic. At your request we'll send more information about the tubing, fittings, and their installation, plus a list of suppliers in your area who handle tubing made of Tenite Butyrate. Write: EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.

A 16mm. sound-color film, "Plastic Pipelines," is available upon request.

TENITE
BUTYRATE
an Eastman plastic



Charles H. Gueffroy, left, president of Portland Gas & Coke Co., and Carl E. Braun, vice-president and manager of Publishers Paper Co., Oregon City, Ore., "turn on the gas" at latter's plant. In foreground are two 6-inch Staynew filters, Model CPHG-10030, part of a large purchase by Portland utility.

Portland Selects Staynew Filters

for Natural Gas Piped from New Mexico

A spectacular 1,500-mile pipeline, bringing natural gas from New Mexico to Portland, Ore., promises a great new source of thermal energy to industries looking for locations, as well as savings of hundreds of thousands of dollars yearly to home gas users.

Portland Gas & Coke Co., which has been in business nearly 100 years, made a rewarding installation of Staynew filters in 1954, and, as a consequence, selected Staynew to filter much of its new supply of natural gas. Staynew filters purchased by the Portland utility in 1956 alone, it is conservatively estimated, are now filtering 25,000,000 scfd. It is also believed that more than 2,000,000 scfd are being filtered into homes by the new Staynew Model CPHB home gas filter.

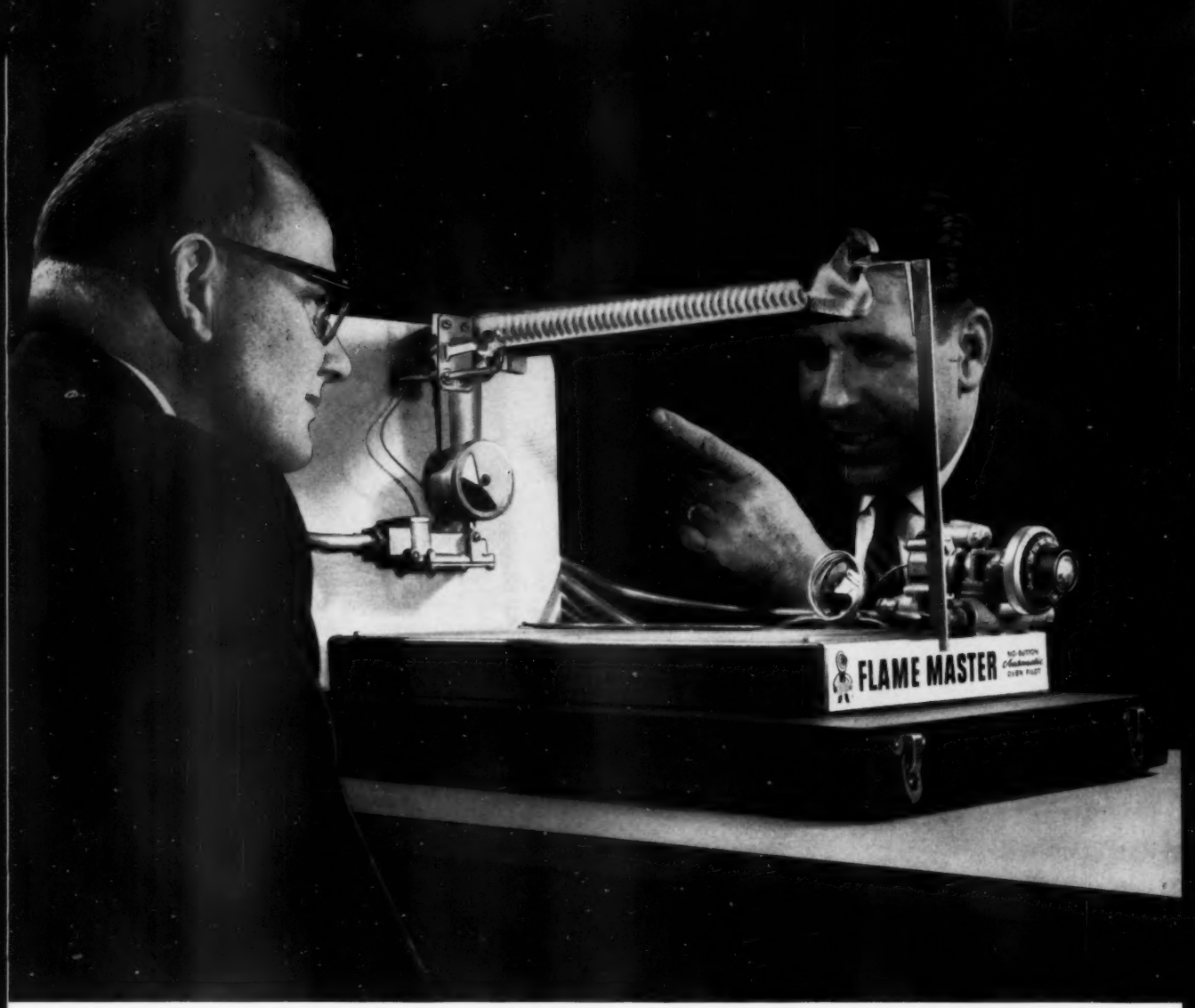
Whatever *your* filtering problem, there is a Dollinger representative nearby, ready to help you solve it. Write Dept. 68, Dollinger Corporation, 68 Centre Pk., Rochester 3, N. Y.

PROTECTOMOTOR

STAYNEW DOLLINGER

FILTERS

LIQUID FILTERS • PIPE LINE FILTERS • INTAKE FILTERS • HYDRAULIC FILTERS • ELECTROSTATIC FILTERS • MIST COLLECTORS • DRY PANEL FILTERS • SPECIAL DESIGN FILTERS • VISCOUS PANEL FILTERS • LOW PRESSURE FILTERS HIGH PRESSURE FILTERS • AUTOMATIC VENTILATION FILTERS • NATURAL GAS FILTERS • SILENCER FILTERS



Tom Evans (at the right), vice president of sales, Equitable Gas Company, Pittsburgh, with Ben Gault, general sales manager of Robertshaw Thermostat Division.

"It's a great idea, Ben...

"It will cut pilot call-backs by 40%! I can just hear our serviceman *answering the phone!* . . . 'Yes, ma'am, that's a FLAME MASTER* automatic oven pilot in your range. *Anyone* can relight it. Yes, there's no need to push a button. Just hold a lighted match to it, and you're in business. Yes, lady, it's a new type. Thanks for phoning. You're welcome.'"

*TRADE MARK VMA 63388

Through Robertshaw research, another advance for the gas industry . . . this FLAME MASTER no-button pilot made from conventional components, *field-proven in millions of gas controls.* Robertshaw Thermostat Division, Robertshaw-Fulton Controls Company, Youngwood, Pa.

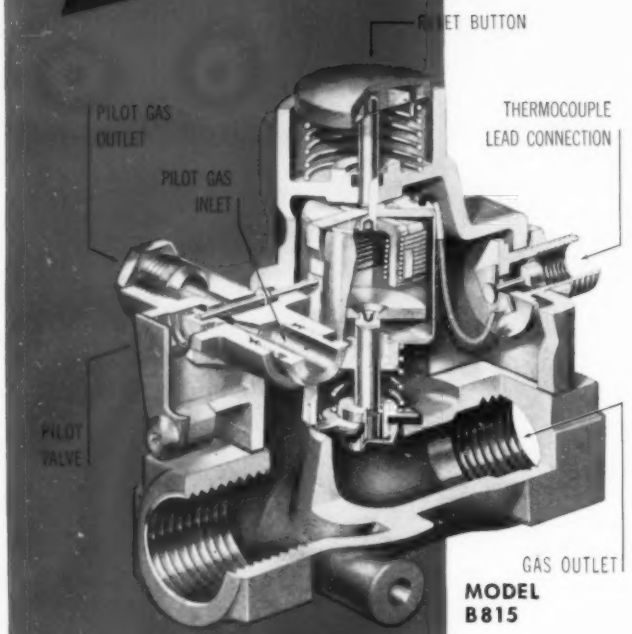
Robertshaw

MR. CONTROLS

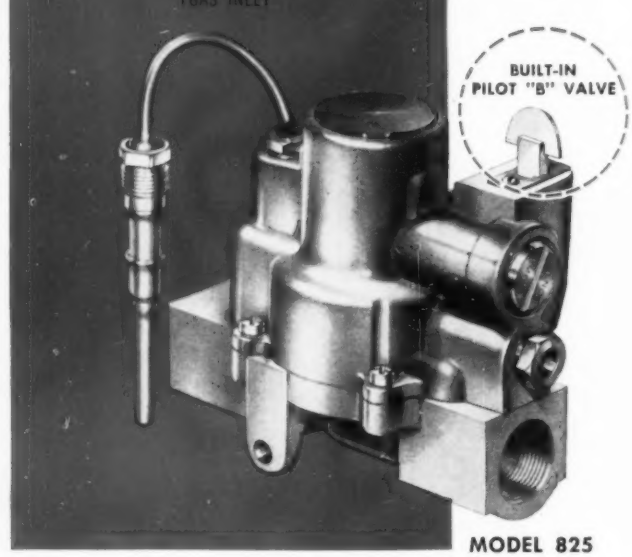
Modified designs for your gas heaters...

BASO® VALVES

- CONSERVE SPACE
- SIMPLIFY INSTALLATION
- INDEPENDENT PILOT VALVE



MODEL B815



MODEL 825

Space-saving Baso valve designs bring you new economy and unexcelled flexibility in installation on room heaters, wall heaters, and central heating appliances.

The Series B815 and B1815 valve can be mounted in any position . . . furnished for either manually or automatically operated gas heaters. *Independent pilot gas control permits these valves to be used either upstream or downstream from an automatic valve and still provide complete shutoff and safe lighting.* Baso design features also provide internal pilot gas takeoff valves for safe lighting and complete shutoff for manually-operated units. Pilot gas inlet and outlet can appear on either side to meet product requirements. The thermoelectric power unit housing can be assembled to the body in either of two positions to facilitate pilot gas and thermocouple connections.

The 825 and 1825 Series Baso valves, companions to the above series, have a built-in pilot gas plug valve. These units are used with manually operated, complete shutoff systems. Same pipe sizes are available as for the B815 and B1815 Series.

The Basotron bipolar magnetic valves make an ideal automatic valve for use with the B815 and B1815 Baso valves.

Check these specifications and tell us about your product design requirements.

For more information about Baso valves, WRITE

BASO INC.

DEPT. SC-3 • MILWAUKEE 1, WISCONSIN

SERIES	INLET AND OUTLET	NATURAL GAS CAPACITY BTU./HR. @ 1" P.D.
B815-400	½" x ½" F.P.T.	172,000
B1815-400	½" x ½" F.P.T.	258,000
B1815-500	¾" x ¾" F.P.T.	306,000
825	⅜" x ⅜" F.P.T.	137,640
825-400	½" x ½" F.P.T.	159,850
1825-500	¾" x ¾" F.P.T.	252,350

pipe protection for the future...

available from 4 strategically located plants

Maximum pipe protection, the only kind worth buying, is available from four permanent Hill-Hubbell plants — Hammond (Indiana), Denver (Colorado), Youngstown and Lorain (Ohio).

Here in fully enclosed, all-weather factories, pipe is coated-and-wrapped to your requirements under precisely controlled conditions. Maximum life expectancy is assured by modern equipment, skilled workers, positive quality control. On-schedule delivery is assured by large capacities, huge pipe stock-piling yards, convenient transportation facilities.

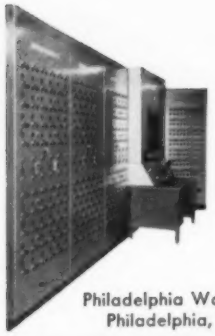
The best pipe protection is the most economical in the long run, so specify Hill-Hubbell — the name synonymous with quality in coated-and-wrapped pipe.

Specify Hill-Hubbell wrapped pipe on your next job . . .

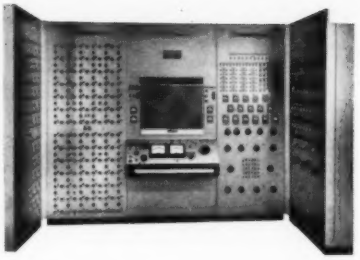
HILL·HUBBELL

FACTORY APPLICATORS OF COATINGS AND WRAPPINGS

HILL-HUBBELL & CO. • 3091 MAYFIELD RD. • CLEVELAND 18, OHIO



Philadelphia Water Department
Philadelphia, Pennsylvania



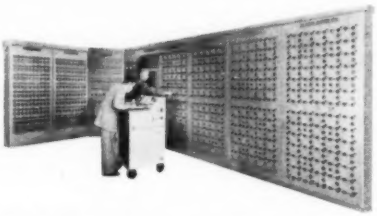
Baltimore County Department of Public Works
Towson, Maryland

McILROY
FLUID NETWORK
ANALYZER

Used by leading utilities to provide up-to-the-minute system analysis and to prove, in advance, plans for expansion and growth.

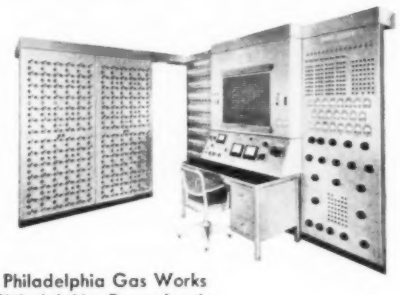
STANDARD
TRADEMARK

Washington Suburban Sanitary Commission
Hyattsville, Maryland



Public Service Electric and Gas Company
Newark, New Jersey

Southern California Gas Company
Los Angeles, California



Philadelphia Gas Works
Philadelphia, Pennsylvania

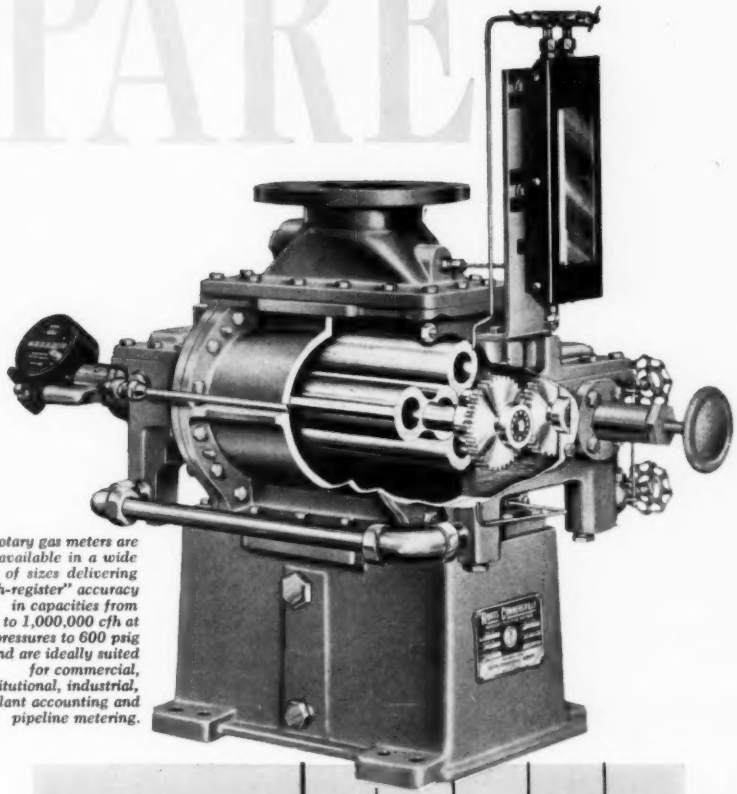
For information and a complete list of users of the McIlroy Fluid Network Analyzer, write to The Standard Electric Time Company, 89 Logan Street, Springfield 2, Massachusetts.

THE STANDARD ELECTRIC TIME COMPANY

Springfield, Massachusetts

COMPARE

More Capacity At Less Cost With R-C Rotary Gas Meters



R-C rotary gas meters are available in a wide range of sizes delivering "cash-register" accuracy in capacities from 2,000 to 1,000,000 cfh at pressures to 600 psig and are ideally suited for commercial, institutional, industrial, interplant accounting and pipeline metering.

Comparative Analysis	SPACE OCCUPIED	TOTAL CAPACITY	METER COST	INSTALLING COST	TOTAL COST
FOUR DIAPHRAGM METERS					
ONE R-C METER					

As the comparative chart indicates, cost is reduced and capacity is increased with R-C rotary positive displacement meters. The total capacity of one R-C meter exceeds that of two or more diaphragm meters. Both initial cost and installing costs are substantially lower. Their small space requirements permit installation in otherwise unusable space. And operating costs are held to a minimum, since maintenance is confined almost entirely to lubrication of gears and bearings and to an occasional check of the operating differential.

Roots-Connersville rotary positive displacement gas meters provide a 15:1 operating range – metering unmatched by any other design. Precision-machined measuring chambers insure unalterable accuracy unaffected by variations in specific gravity, rate of flow, pulsations or impurities. And there are no valves, diaphragms or other small parts to wear and cause inaccuracies.

Pressure drop is minimized, since R-C's straight-through design eliminates winding passages and restricting ports. Even at low flows, these meters retain "cash-register" accuracy. These advantages are the result of R-C's specialized experience of more than 100 years in the design and application of air and gas handling equipment.

For additional data, please refer to pages 565-568 in **Chemical Engineering Catalog,** *our section in* **Mechanical Catalog** *or write for* **Bulletin M-258**

ROOTS-CONNERSVILLE BLOWER
DIVISION OF DRESSER INDUSTRIES, INC.
459 Oregon Ave., Connersville, Indiana. In Canada—629 Adelaide St., W., Toronto

New Berry Pump designed for direct coupling to prime mover

The new Berry Hydraulic Pumps offer maximum efficiency in operation of cooler fans and other auxiliaries.

Available with 21 standard gear ratios in four basic sizes, this series of pumps may be direct coupled to a wide variety of prime movers. This eliminates the cost of belt drives and permits use of the smallest, most economical pump consistent with the system requirements.

NO WASTED POWER—There is no wasted horsepower . . . no loss of efficiency in power transmission from the compressor shaft or other prime drive.

From a single Berry Hydraulic Pump as many as four Berry Hydraulic Motors may be operated under varying load requirements. Thus, power can be supplied simultaneously to separately controlled fans for cooling jacket water, gas and lube oil, and a fourth fluid motor powering the water pump or some other auxiliary.

Complete Berry pump/motor "package" units for the gas industry offer the safety required for operation in hazardous locations, proven dependability and maximum efficiency. Write for complete information.

CHECK THESE FEATURES OF THE NEW BERRY PUMPS

- 21 standard gear ratios in 4 basic sizes
- Design input or output speeds from 250 to 1750 rpm
- Capacities from 60 to 240 gpm
- Proven in service
- Pump and gearhead built in one integrated unit
- Up to 4 independent circuits operating from one pump
- Can be manifolded to fit your requirements
- Belt drive eliminated . . . no wasted horsepower
- Complete safety in hazardous locations

BERRY HYDRAULICS *A division of Oliver Tyrone Corporation*

General sales office: Oliver Building, Pittsburgh 22, Pa.—Southern sales office and plant: Corinth 1, Miss.

Proved outstanding under every digging condition, here the new Model 774 digs 5½-foot-deep trench through Texas "Gumbo.

NEW DUAL-HYDRAULIC* SPOIL CONVEYOR

Provides full range of belt speeds at all wheel speeds . . . under any condition

The new dual-hydraulic spoil conveyor is just one of the many new, exclusive features which enable the all-new Barber-Greene Model 774 to dig up to 25% more ditch per day. It offers you these unmatched advantages:

All-hydraulic drive utilizes separate hydraulic motor at each end of conveyor . . . eliminates all drive sprockets, chains and mechanical transmission.

Independent conveyor drive divorces conveyor speed from both wheel and crowding speeds.

Instant speed selection while operating. Speeds infinitely variable to 640 fpm. Instant reverse.

New rubber impact rollers eliminate shaft bending and greatly reduce material build-up for greater belt life.

Fully enclosed design reduces maintenance costs by further reducing material build-up under belt.

Optional 2-foot extension available for special soil conditions and wide cutting widths—folds to 8-foot width for travel.

*Hydraulic motors drive spoil conveyor from both ends regardless of belt direction. Write for 16-page booklet on this new ditcher.

All the new, exclusive Model 774 advantages add up to fastest, lowest-cost trenching

• Dual-Range Hydra-Crowd • New Digging Wheel Drive • New Flexible Drawbar • New Hydraulic Controls • New Crawler Design • New Automatic Overload Protection • New Hydraulic Brakes • New Hydraulic Boom Hoist

Write for information on the ditcher line of advanced design.

58-27-D

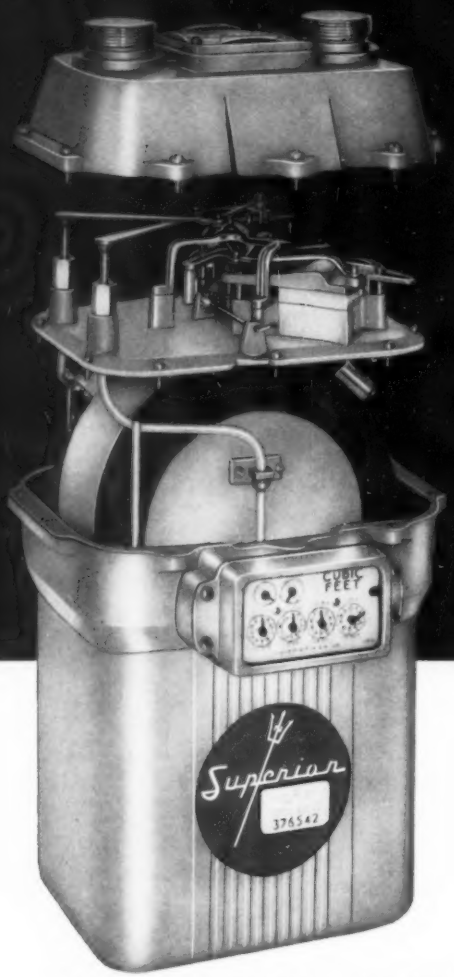
Barber-Greene BG

AURORA, ILLINOIS, U.S.A.

CONVEYORS . . . LOADERS . . . DITCHERS . . . ASPHALT PAVING EQUIPMENT

16 REASONS
SUPERIOR Aluminum Case METERS

give you Long-term Accuracy . . .
. . . Easy Maintenance . . .
. . . High Customer Appeal



1. **Slow movement...**
2. **Simple horizontal seam...easily sealed.**
3. **Accessible table...just remove the screws holding top.**
4. **Meter top removable without disturbing index box.**
5. **Valves readily accessible when top is removed.**
6. **Seam gasket stays resilient...**
7. **Entire mechanism lifts out with valve table.**
8. **Heavy-duty, sintered bronze bearings oil-impregnated for life.**
9. **Flag arrangement gives arm smooth operation and longer life.**
10. **Accurately-controlled diaphragm... no inaccuracies from deflection.**
11. **Cupped side flanges permit easy and safe carrying.**
12. **Calibration through convenient hand hole.**
13. **Broad base for conveyorized handling. Flats on top permit solid stacking.**
14. **Index removable without disturbing meter.**
15. **Modern appearance for quick customer acceptance.**
16. **Conforms to latest A.G.A. standardization specifications.**

Superior now manufactures aluminum case meters in 175 cfh, 250 cfh and 340 cfh sizes to meet most domestic requirements. To find out how this advanced-design meter will fit into your planning send for bulletin 1150... or, better still, phone the Superior representative nearest you. He understands your needs and stands ready to give you good, quick service.

SUPERIOR METER COMPANY, INC.

19 West 50th Street, New York 20, N. Y.

A SUBSIDIARY OF NEPTUNE METER COMPANY

neptune

Branch Offices: Atlanta • Boston • Chicago • Dallas • Denver • Los Angeles Louisville • New York • North Kansas City, Mo. • Philadelphia Portland, Ore. • San Francisco

In Canada: Neptune Meters Ltd. • Toronto • Calgary • Halifax Montreal • St. John • Vancouver • Winnipeg

15

NOW...Perfection in SILENT GAS VALVES

New Silent Knight *by* WHITE-RODGERS

At last . . . a gas valve that combines *all* the desired features . . . completely silent operation . . . functional beauty . . . unequalled reliability . . . service-free performance.

Built to White-Rodgers exacting standards of quality, field-tested and perfected . . . yet priced to sell!

Mail coupon now!

EVERY WANTED TYPE AND SIZE

Basic valve ① with non-recycling ③ or automatic recycling ③ manual operator; basic valve for plug-in pilot ④ plus non-recycling ⑤ or automatic recycling ⑥ manual operator; line or low voltage.

Available soon: built-in pressure regulator, "A" and "B" cocks, adjustable step-opening.

EVERY DESIRABLE FEATURE

- Completely silent, even in high ambient temperatures
- Same current rating for all models
- Simple wiring . . . top mounted terminals
- Mounts in any position on horizontal gas line
- No bleed tube needed
- AGA-listed for all gases
- Interchangeable; body lengths and dimensions conform to NEMA standards
- Designed by Earl Claus

WHITE-RODGERS

WHI-177

ST. LOUIS 6, MISSOURI
TORONTO 8, CANADA

WHITE-RODGERS COMPANY
1209 Cass Avenue,
St. Louis 6, Missouri

Please send me complete details on your new "Silent Knight" gas valves.

Name _____

Company _____ Title _____

Address _____

City _____ Zone _____ State _____

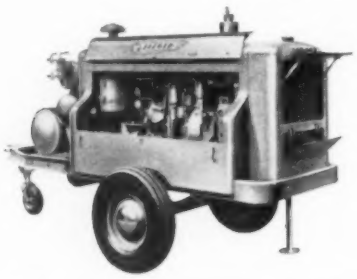
DRILLING GAS MAINS UNDER PRESSURE: Jaeger "125" rotary compressor powers a Mueller C1-36 Drilling Machine, drilling a 10" main under pressure, preparatory to installing line stopper plug. The unfluctuating pressure maintained by the Jaeger rotary insures a uniformly accurate cut, vital for proper seating of the inserted plug.

Jaeger Rotary maintains constant pressure at slower operating speeds

Jaeger compressors produce the same volume of air as other rotaries at 100 to 350 rpm slower engine speeds. Full load speed is only 1700 rpm, compared with 1800 to 2150 rpm in others. This higher Jaeger efficiency saves horsepower, saves fuel, saves engine and compressor wear.

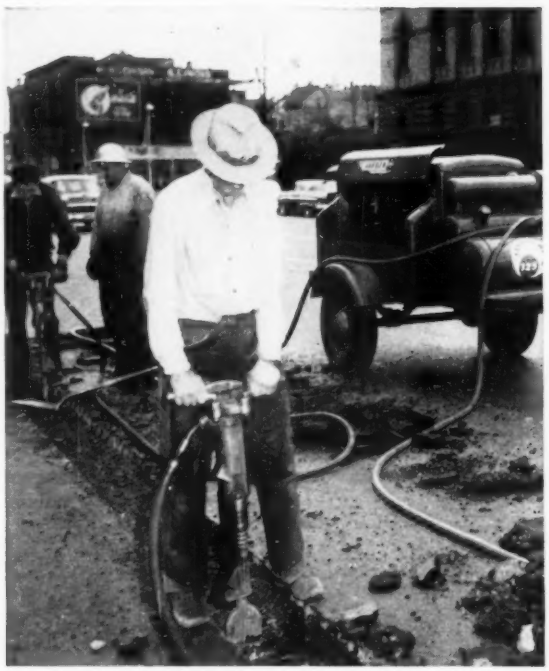
Instantaneous air delivery and smooth, stepless speed modulation enable a Jaeger rotary to maintain 100 lbs. constant pressure under all normal operating demands.

8-hour fuel tanks, full size tool boxes and retractable pneumatic tired dolly wheel are standard on all 2-wheel models. For complete data or demonstration, ask your Jaeger distributor or write for Catalog JCR8.



JAEGER "250" — biggest rotary compressor on two wheels. 4-wheel units to 600 cfm.

THE JAEGER MACHINE COMPANY
661 Dublin Ave., Columbus 16, Ohio
PUMPS • CONCRETE MIXERS • TRUCK MIXERS • PAVING MACHINES



FAST TRENCHING: Jaeger "125" maintains full pressure in two #25 Thor breakers. Speeds trench cutting and other work with power tools.

REPAIR BROKEN MAINS IN 15 MINUTES!

One-man job . . . any pressure . . . terrific economy! Not only splices main, but *sealed gasket* absorbs future traffic jar or frost heaving! Refer to page 8 of our new Catalog GW. M. B. Skinner Co., South Bend 21, Indiana.

SIZES 2" TO 24" INCL.

SKINNER-SEAL SPLIT COUPLING CLAMP

GEM price tags help sell appliances on the display floor.

See Playhouse 90 on CBS-TV.

GEM CATCHES THEM ALL AT HOME

where they're most receptive to home improvement ideas.

GEM national magazine advertising bats 1.000 – selling millions of homeowners on the comforts and convenience of GAS for the 7 big household services.

Advertisements in the Saturday Evening Post, Better Homes & Gardens, New Homes Guide and Home Modernizing sell gas, gas appliances and gas equipment. They help insure the future growth of the Gas Industry.

Gas utilities gain added impact from these advertisements by publishing free GEM ad mats in local newspapers. Others use free reprints to dramatize the advantages of gas service.

GAS EQUIPMENT MANUFACTURER'S GROUP — GEM — MEMBER

These 15 suppliers to the Gas Industry are contributing to a brighter future for themselves and for their customers:

American Cast Iron Pipe Co.
American Meter Co.
Cleveland Trencher Co.
Fisher Governor Co.
E. F. Griffiths Co.
Koppers Co. Inc.
Mueller Co.
Pipe Line Service Co.
Rockwell Manufacturing Co.
M. B. Skinner Co.
Sprague Meter Co.
Superior Meter Co.
Subsidiary of Neptune Meter Co.
The Tapecoat Co.
U. S. Pipe and Foundry Co.
Vulcan Rubber Products
Division of Reeves Brothers, Inc.

All suppliers are invited to join the GEM program. To participate, ask any GEM sponsor or write Gas Equipment Manufacturers Group, Room 2925, 60 East 42 Street, New York 17, N. Y., for information about contributing to Gas Industry progress.

Published as a service to the Gas Industry by

AMERICAN® METER COMPANY

INCORPORATED (ESTABLISHED 1836)

Suppliers to the Gas Industry for:
Ironcase, Tinned Steelcase, Aluminumcase and Welded Steelcase Meters
American-Westcott Orifice Meters • Instruments • Reliance Regulators
Apparatus • Valves

Gas budgets hit $2.2 billion

TOTAL BUDGETS: $2,241,194,000

Distribution $554,854,000

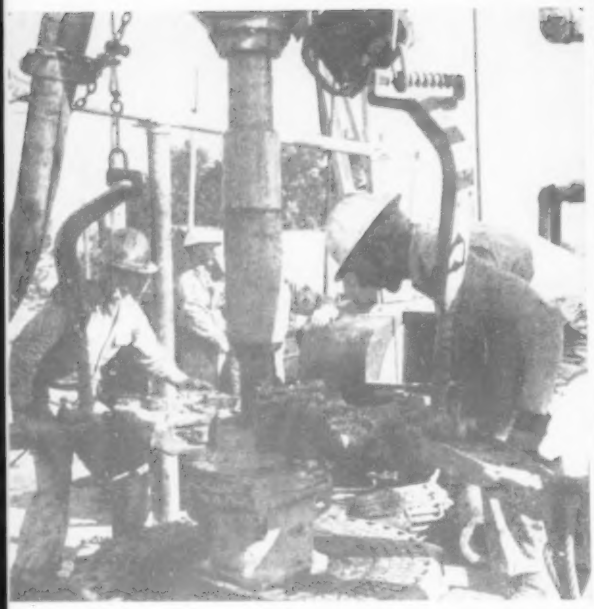
Transmission $1,317,571,000

Production $182,929,000

Storage $102,831,000

General $83,009,000

GAS' Twelfth Annual Construction Budget Survey



1959—Biggest year of expansion for expansion-minded gas industry

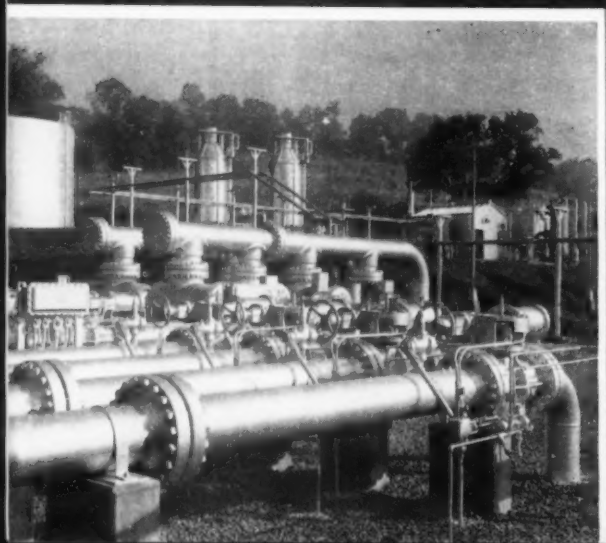
THE "Memphis decision" and the recession of last year are only distant, and unpleasant, memories of the past for the North American gas industry, which this year will spend an all-time record $2,241,194,000 for new construction. This is the third straight year budgets have passed the $2 billion level.

This $2.2 billion figure represents the 1959 construction budgets of 220 gas companies—distribution, transmission and integrated—which participated in GAS' 12th Annual Survey of Gas Industry Construction Projects. These 220 companies serve about 87 per cent of the connected meters and operate 95 per cent of the total pipeline miles in the gas industry.

Total budgets for this year are up a healthy 9.5 per cent over last year, and 3.2 per cent ahead of 1957, the previous high period.

The gas industry today ranks as the fifth largest in the U. S., based on plant investment. It has made tremendous strides in the 143 years since the first manufactured gas plant was built in Baltimore, Md. From this inauspicious start in 1816, it has progressed to where the nation's gas companies (distribution and transmission) have 564,000 miles of pipe in the ground—enough to circle the earth 22 times.

According to statistics presented by the American Gas Association, the gas industry now serves 32 million customers, and is adding new ones at the rate of a million a year. A permanent investment of $600 in facilities is required by the industry to serve each of these customers. Gross assets of the

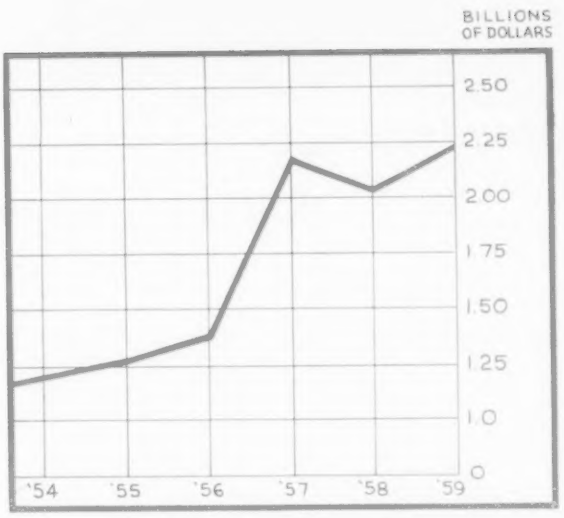


gas industry are now estimated at $21.5 billion—by 1960, they are expected to reach $25 billion.

The biggest share of this year's expenditures, $1.3 billion (58 per cent of the total), has been allocated for transmission facilities. Twenty-five per cent of the total $2.2 billion (554.8 million) will be spent on construction of new distribution facilities.

Eight per cent of the gas industry's total budgets in 1959 will go for gas production—$182.9 million. Another 5 per cent ($102.8 million) will be spent for the construction of new storage facilities, or expansion of present ones. The remaining 4 per cent ($83 million) will go for general expenditures.

Reversal of the controversial Memphis decision late last year has done much to spur the expansion plans of the industry. Last year, this ruling caused the abandonment of more than one major project, and brought about some financing difficulties. Now, with this decision over-ruled by the Supreme Court, a much healthier climate exists.



Gas industry expenditures—1954-1959

Here is how the money will be spent this year

DISTRIBUTION

New mains (miles—8821)	$ 234,133,000
Mains replacement	53,084,000
New meters & services	176,337,000
Regulator stations & equip.	10,001,000
Measurement stations & equip.	2,275,000
Dist. compressor stations	2,947,000
Automatic control equip.	717,000
Odorization	107,000
Filtering & cleaning equip.	102,000
Miscellaneous	18,675,000
Dist. not categorized	56,476,000
TOTAL	$ 554,854,000

GENERAL

Office systems & equip.	$ 4,638,000
Autos and trucks	16,185,000
Construction equip.	7,178,000
Cathodic protection	3,993,000
Communications	3,288,000
Buildings	21,262,000
Other	17,872,000
General, not categorized	8,593,000
TOTAL	$ 83,009,000

TRANSMISSION

New lines (miles—9482)	$ 478,219,000
Replacement of lines	62,012,000
Compressor Stations	79,960,000
Pressure control & measurement stations	27,565,000
Automatic control equip.	1,133,000
Miscellaneous	12,698,000
Transmission, not categorized	655,984,000
TOTAL	$1,317,571,000

PRODUCTION

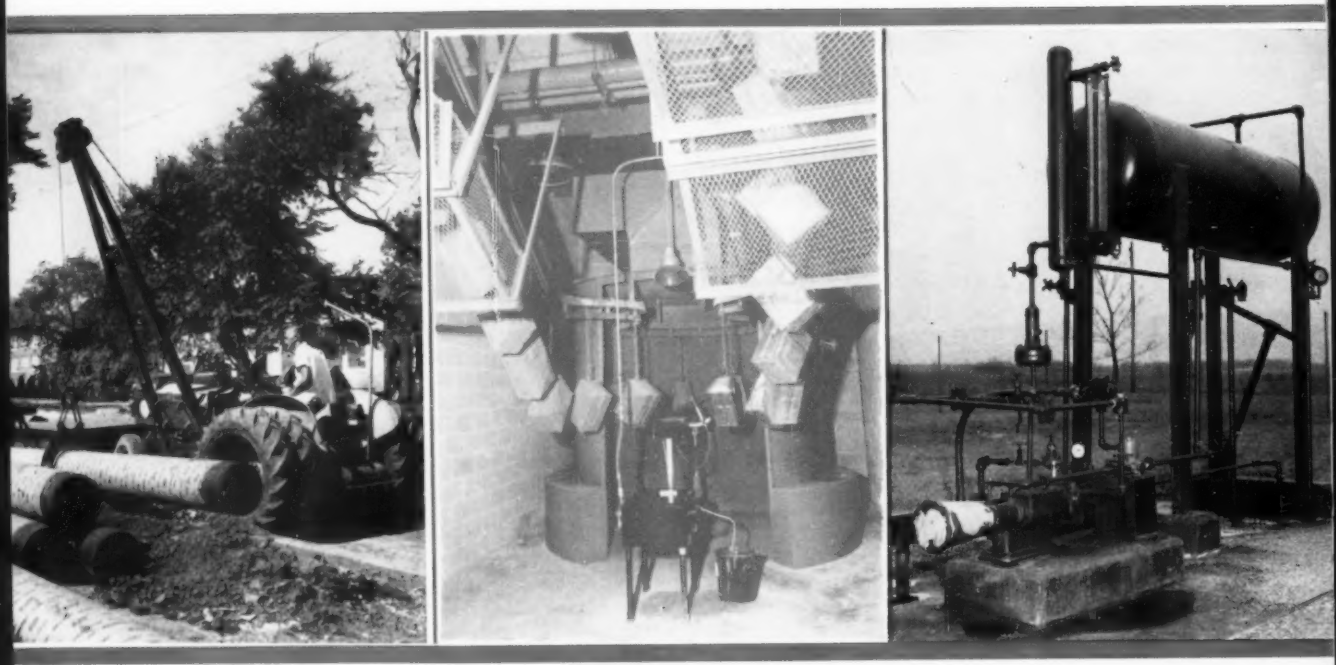
Drilling & production	$ 82,008,000
Gathering lines	29,665,000
Field compressors	44,235,000
Miscellaneous	15,734,000
Production, not categorized	11,287,000
TOTAL	$ 182,929,000

STORAGE

Underground (natural gas)	$ 56,069,000
LPG plant	6,143,000
Mfg. gas plant	5,918,000
Miscellaneous	2,649,000
Storage, not categorized	32,052,000
TOTAL	$ 102,831,000

TOTAL $2,241,194,000

Distribution budget—$554,854,000



SYSTEM expansion—more than half a billion dollars worth—will be the keynote for distribution companies in North America again this year.

Since 1952, distribution companies have been adding an average of a million customers a year to their lines. This growth is expected to continue at the million a year rate for another eight years.

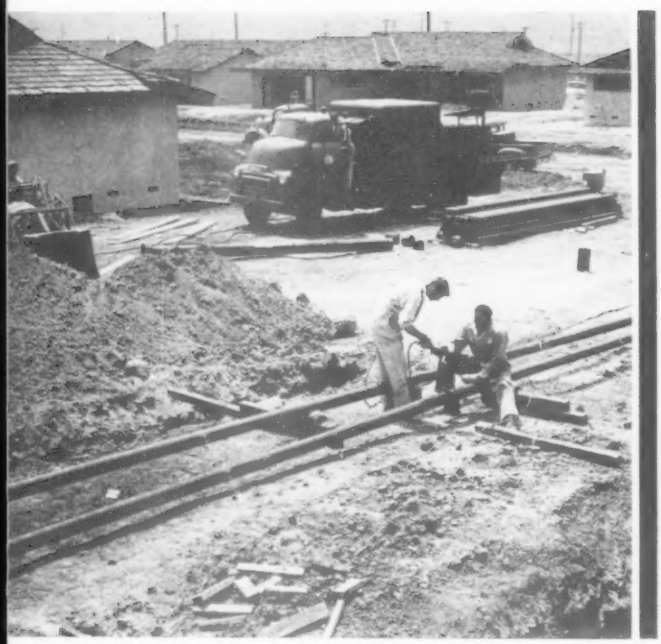
Distribution companies today are providing the fuel to operate seven major household appliances. This same fuel has some 25,000 uses in industry.

Continued improvement of these appliances, and more widespread use of gas in industry, keeps the gas load growing. That's why the distribution companies of North America have budgeted $554,854,000 for system expansion in 1959.

As could be expected, new mains will be the big order of business for 1959. Distribution companies will spend $234,133,000 building them. About 75 per cent of the companies replying to GAS' Survey listed their expected mileage on new mains—8821 miles. It is obvious that the overall total should exceed 10,000 miles this year.

Several big, new main-building programs are on tap. Biggest is planned by Northern Illinois Gas Co. (Aurora, Ill.), with 600 miles. Other major mains programs include: Consumers Gas Co. (Toronto, Ont.), 555 miles; Consumers Power Co. (Jackson, Mich.), 500 miles; Southern California Gas Co. (Los Angeles), 389 miles; Atlanta (Ga.) Gas Light Co., 387 miles; Pacific Gas & Electric Co. (San Francisco), 370 miles; B. C. Electric Co. (Vancouver, B. C.), 322 miles; Public Service Electric & Gas Co. (Newark, N. J.), 300 miles; Saskatchewan Power Corp. (Regina, Sask.), 300 miles; Arizona Public Service Co. (Phoenix), 270 miles.

As can be seen from this listing, this mains-building spree is not confined to any one specific spot in North America. The demand for more natural gas is not limited to certain areas; it is prevalent in just about any region in the U. S. and Canada.



While the gas utilities will be spending the biggest portion of their 1959 budgets on new mains, they'll be doing a good business in new meters and service lines, too. A total of $176,337,000 is earmarked for these items in 1959. Another $53,084,000 has been budgeted for replacement of old mains during the year.

While this year looks like it will be another big one for distribution companies, it probably will be only the start of bigger things to come. The American Gas Association's bureau of statistics predicts that, with vigorous promotion and product development, nearly 300 million gas appliances of all types could be sold in the next 20 years. The sales-minded gas industry is not going to let this potential pass by untouched.

Another factor that points toward continued expansion of distribution systems is the fact that space heating restrictions still are in force in many parts of the East and Midwest. The goal of the gas industry, of course, is to be able to serve all heating customers without restriction. This goal will be met, but it will take continued expansion by the industry to do it.

This year, a "new" gas distribution industry will emerge in Florida. This state, the last major population center without natural gas, will get it this summer, through the now-under-construction pipeline of Houston Texas Gas & Oil Corp. and Coastal Transmission Corp. This oft-delayed project will provide Florida's gas utilities with a fuel that is competitive with other forms of energy, which now monopolize the state. The Houston-Coastal line will serve 18 existing systems which now distribute manufactured oil-gas, or LPG-air gas. In addition, it will connect with 16 new systems (mainly municipal) which will be built soon to serve natural gas in communities that now depend upon LPG, electricity, or fuel oil. In actuality, a new gas industry will be born this year in Florida.

Transmission budget— $1,317,571,000

REVERSAL of the Memphis decision—that year-long cloud which hovered over and dampened the spirits of the gas industry—has touched off what appears to be a record year for natural gas pipelining.

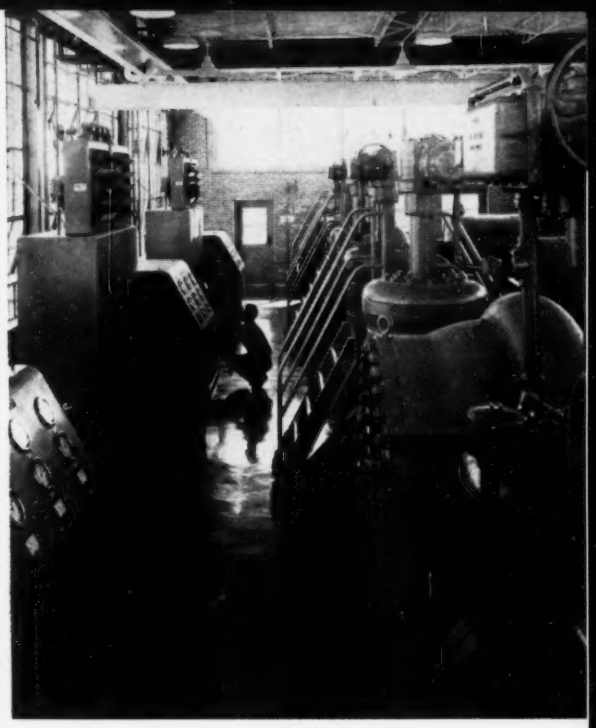
With this roadlock removed from its path, the gas industry reports it will spend a tremendous $1,317,517,000 to build transmission facilities—highest annual amount in history.

This will include the construction of 9482 miles of new pipeline, which means that most of the pipelining in North America will be for natural gas. Crude oil lines scheduled to be built this year total 2450 miles, while products lines for '59 come to only 450 miles.

Two new pipelines probably will come into being during 1959. Both have their cases before the Federal Power Commission now.

Biggest of the two is the $193 million plan of Transwestern Pipeline Co. (Houston) to build a line from west Texas to the California border, where it would deliver natural gas to Pacific Lighting Gas Supply Co., which in turn would sell to its sister companies, Southern California and Southern Counties Gas companies, in the metropolitan Los Angeles area. Transwestern's backers are optimistic, say they'll be making pipeline this summer.

The other new one is actually not so new. It is the amended version of Midwestern Gas Transmission Co.'s plan to serve the Chicago market. Midwestern is now seeking an FPC okay to build a line from Portland, Tenn., to Chicago, where it would sell to Peoples Gas Light & Coke Co., and other distributors in the heavily populated Midwest. This version of the Midwestern plan will be built at a cost of $50.8



million. It was conceived last year, after FPC had turned down a proposal by Midwestern to build a line from Portland, Tenn., to Emerson, Man., at the Canadian border, where it would pick up Canadian gas from Trans-Canada Pipe Lines Ltd.

Another big expansion program is the one planned by Trunkline Gas Co., which will spend $81.5 million to extend its mainline system to the thriving market area of Michigan, where it will sell to Consumers Power Co. (Jackson, Mich.).

Colorado Interstate Gas Co. (Colorado Springs, Colo.) also is planning to serve new markets. It plans to spend $69.6 million this year, mostly on its part of a three-way project with Pacific Northwest Pipeline Corp. (Salt Lake City) and El Paso Natural Gas Co. to provide additional supplies of gas to the booming area of southern California.

But, the big pipeline projects won't be strictly confined to either new systems, or entries into new market areas. Many of the major transmission companies will pour big amounts into expanding their present systems to provide more supplies to present customers.

Best example is Transcontinental Gas Pipe Line Corp. (Houston), which has budgeted $118 million for expansion of its mainline facilities. Right behind is Tennessee Gas Transmission Co. (Houston), with an expansion program totaling $103.8 million. El Paso Natural plans to build $85.2 million worth of new pipeline and compressor facilities.

Two major pipelines which had been relatively quiet in the expansion picture in recent years plan to come back strong this year. Michigan-Wisconsin Pipe Line Co., a subsidiary of Detroit's American Natural Gas System, has a $54.8 million construction program ready to roll. And, down in Owensboro, Ky., Texas Gas Transmission Corp. has $53 million worth of mainline building set for '59.

Texas Eastern Transmission Corp. (Shreveport, La.) has a $38 million pipeline building budget, while Birmingham's Southern Natural Gas Co. will put $31 million into new facilities for its system.

This year also will see the completion of a new major pipeline system—the combined project of Houston Texas Gas & Oil Corp. and Coastal Transmission Corp. These two subsidiaries of Houston Corp. (St. Petersburg, Fla.) are building a pipeline from Texas' Rio Grande Valley to Miami, Fla. Houston and Coastal this year will spend $122.5 million between them to complete the project. Delivery of natural gas is expected this summer in Florida.

With the completion of the Houston-Coastal line, all major population areas in North America will be served by natural gas transmission systems. However, this doesn't mean that the end is in sight for major new pipeline projects.

Actually, the second biggest natural gas pipeline project ever planned is now on the drawing boards. It is the ambitious plan of Pacific Gas & Electric Co. (San Francisco) to import Canadian gas to meet its ever-growing demands in central and northern California. This $300 million project (topped in cost only by the $387 million Trans-Canada line) involves several PG&E subsidiaries. The parent company is hopeful of getting the needed approvals this year from Federal and State authorities in the U. S., and from Canadian governmental bodies.

1959 budgets of 220 gas companies

COMPANY (In thousands of dollars)	TOTAL	DISTRIBUTION (In thousands of dollars)										(In thousands of dollars)	
		New Mains	Mains Replacement	New Meters and Services	Regulator Stations and Equipment	Measurement Stations and Equipment	Distribution Compressor Stations	Automatic Control Equipment	Odorization	Filtering and Cleaning Equipment	Miscellaneous	Office Systems and Equipment	Autos and Trucks
Alabama Gas Corp., Birmingham	5040	1810	50	1980	100	100		40			100	40	180
Alberta Gas Trunkline Co., Calgary, Alta	22,853											23	142
Alexander City (Ala.) Municipal System	26	8		7	6	2							3
Algonquin Gas Transmission Co., Boston	6890												60
Ambridge (Pa.) Gas Co.	20		5	1	14								
American Louisiana Pipeline Co., Detroit	2219												
Arizona Public Service Co., Phoenix	4339	1800	106	2023	26	6					255		68
Arkansas Louisiana Gas Co., Shreveport	17,850												
Arkansas Missouri Power Co., Blytheville, Ark.	340	115		87		10					13	5	10
Arkansas Western Gas Co., Fayetteville, Ark.	1386	200	20	85							36	6	25
Associated Natural Gas Co., Blytheville, Ark.	329	89		90	5	5					6		10
Atlanta (Ga.) Gas Light Co.	10,400	5278	270	2945	120	175					214	40	205
Baltimore (Md.) Gas & Electric Co.	7000	←				6800					→		
Berkshire Gas Co., Pittsfield, Mass.	947	188	101	106	12			1				24	19
Bluefield (W. Va.) Gas Co.	20	10		2	2						3	3	
Boston (Mass.) Gas Co.	3130	1070	640	820	40							10	300
Bridgeport (Conn.) Gas Co.	1555	910		425	15	77					35	10	72
B. C. Electric Co., Vancouver, B. C.	13,314	9072	183	3150	109	21	42				5		342
Brooklyn (N. Y.) Borough Gas Co.	446	63	45	231	7	7					8	18	34
Brooklyn (N. Y.) Union Gas Co.	15,922	9000	600	3777	600	334					86	50	
Cabot, Godfrey L., Inc., Charleston, W. Va.	1215	50	10	10	5	5					5		40
California-Pacific Utilities Co., San Francisco	255	234										6	13
Carolina Natural Gas Co., Hickory, N. C.	177	←				177					→		
Cambridge (Mass.) Gas Co.	919	50	80	81	30							4	
Canadian Western Natural Gas Co., Calgary, Alta	5901	1106	125	1208	243						100	18	149
Cascade Natural Gas Co., Seattle, Wash.	487	152		305	2	3					3		
Central Electric & Gas Co., Lincoln, Neb.	1463	325	265	540	13				2			29	94
Central Hudson Gas & Elec. Corp., Poughkeepsie	1255	400	160	195	5			15			20		
Central Illinois Elec. & Gas Co., Rockford	1972	1091	89	663	50				3		19	2	18
Central Illinois Light Co., Peoria	2695	969	391	1196	55							1	39
Central Illinois Public Service Co., Springfield	1082	98	118	300		20					10		
Central Indiana Gas Co., Muncie	2027	219	156	352	68	13						5	45
Central Louisiana Electric Co., Lafayette	1390	400		240									22
Chattanooga (Tenn.) Gas Co.	366	127	44	118	6							4	25
Chicago District Pipeline Co., Chicago	12,900												
Cincinnati (Ohio) Gas & Electric Co.	5008	1550	255	1100	35			30			480	8	140
Cities Service Gas Co., Oklahoma City	8693											18	170
Citizens Gas & Coke Utility, Indianapolis	6266	1260		600	60				6	18		28	131
Citizens Gas Co., Hannibal, Mo.	90	15	20	25									
Citizens Gas Co., Tuscola, Ill.	52	20	5	15	3								6
Citizens Gas Fuel Co., Adrian, Mich.	131	40	40	25	2				2			12	6
City Gas Dept., Charlottesville, Va.	110	90		12	8								
Coastal Transmission Corp., Houston, Texas	52,597											100	180
Colorado Interstate Gas Co., Colorado Springs	69,644											49	281
Colorado Springs (Colo.) Gas Dept.	250	←				250					→		
Colorado-Wyoming Gas Co., Denver	134					49						3	12
Columbia Gas System, New York	95,000	←				23,750					→	←	
Concord (N. H.) Natural Gas Co.	60	22	5	12	1						2	8	3
Connecticut Gas Co., Hartford	159												
Connecticut Light & Power Co., Hartford	1873	814	190	346	117								65
Consolidated Edison Co., New York	8700	←				6100					→	←	
Consolidated Gas Utilities, Oklahoma City	2069	275	225	250	60						40	50	97
Consumers Gas Co., Toronto	20,859	9982		6408	116	61					103	96	230
Consumers Power Co., Jackson, Mich.	58,576	8340	2385	9406	539						15		
Corning (N. Y.) Natural Gas Corp.	214	52	13	43	8							2	5
Corpus Christi (Texas) Gas Dept.	490	193	110	55	10				1	3			11
Decatur (Ala.) Gas Dept.	47	22	6	12							1		3
Delaware Power & Light Co., Wilmington	1334	425	253	536	26						10	26	23
Delaware Gas Co., Delaware, Ohio	55	30	10	8	1							3	1
El Paso (Texas) Natural Gas Co.	183,508												
Fall River (Mass.) Gas Co.	626	100	50	40	100						10		14
Fitchburg (Mass.) Gas & Electric Light Co.	76	40		30								1	5
Gas Service Co., Kansas City, Mo.	5864	3000		2095								97	259
Greeley (Colo.) Gas Co.	916	200	20	20	15	3		5			50	25	15
Green Mountain Power Corp., Burlington, Vt.	30		8	10									3
Greenwich (Conn.) Gas Co.	300	132	20	73							50	8	14
Greater Winnepeg (Man.) Gas Co.	4641	2479		1912	91	35						15	48
Hartford (Conn.) Gas Co.	1855	673	52	350		33	39	30			79	11	39
Hastings (Neb.) Utilities Dept.	87			75									5
Hope Natural Gas Co., Clarksburg, W. Va.	10,988	467	680	140								72	307
Housatonic Public Service Co., Derby, Conn.	471	225	94	119				15			10	5	3
Houston (Texas) Gas Dept.	2			2									

GENERAL (In thousands of dollars)					PRODUCTION (In thousands of dollars)				STORAGE (In thousands of dollars)				TRANSMISSION (In thousands of dollars)					
Construction Equipment	Cathodic Protection	Communications	Buildings	Other	Drilling and Production	Gathering Lines	Field Compressors	Miscellaneous	Underground (Natural Gas)	LPG Plant	Mfg. Gas Plant	Miscellaneous	New Lines	Replacement of Lines	Compressor Stations	Pressure Control and Measurement Stations	Automatic Control Equipment	Miscellaneous
50	20	10	10	100						450			20,941			588		
259				900														
40	20	15	30										600	50	6000	75		
													2219					
30	25																	
5	10	1		5									←		17,850			→
													79					
15					400	43		70	130				255	50		1		50
5	10	3		5									25	25	50			1
90		36	515	22						490								
					←		200	→					420					
			10	66														
70				110						70								
11																		
71	21		130	2						146	20							
		2	4	12							15							
85	75		275	1040		883	207											
				2														
4			10								660							
71	44	38	178	28	300	210		239	281			48	1298	117	65	7	28	
	4			18														
8	10	25	142	10														
	40			25									145	80		140		30
19	3		7	8														
36	8																	
												15		503				18
32	5	1	428						450					253				
15	20	7			140	10	40	10					290	60	41	70	25	
20	2	1	1	1						17			12,400			400	100	
				15				15		650			150	350	200			30
		73		53	35	1234	83		1164				3368	1441	610	215		229
63			250						1500	30	150		2200					
2	1																	
2	2																	
	160													47,093		4529	140	395
146		940		50	377	1428	1119	547					54,647	123	8377	359		1201
4		3												46	12	5		
—	4750	—	—	→	←	—	9500	→	←	—	19,000	→	←	—	38,000			→
3			4															
				13							328		157			2		
	2180	—	—	→	←	—	400	→	←	—	20	→						
25	150		15			158			9				150	350		100		115
66	86	11	28	29									3361			153	81	48
245	108			1713	3145		4975	10,586					16,979			140		
4														79	8			
9	45	2	10										41					
		3																
23				12														
		2			46,550	14,358	37,350						67,000		16,000			2250
		12									300							
116			297															
1	1	3	100	458							9							
			3															
	6			55														
			408	74							50	17						
5		2																
		141	75		3787	735		255	207				2330	674	1013			125

1959 budgets of 220 gas companies

COMPANY (In thousands of dollars)	TOTAL	DISTRIBUTION (In thousands of dollars)										(In thousands of dollars)	
		New Mains	Mains Replacement	New Meters and Services	Regulator Stations and Equipment	Measurement Stations and Equipment	Distribution Compressor Stations	Automatic Control Equipment	Odorization	Filtering and Cleaning Equipment	Miscellaneous	Office Systems and Equipment	Autos and Trucks
Houston Corp., St. Petersburg, Fla.	11,459	←				11,459					→		
Houston Texas Gas & Oil Corp., St. Petersburg, Fla.	70,000											193	216
Illinois Power Co., Decatur	9192	1127	1240	3168							181		
Indiana Gas & Water Co., Indianapolis	2079	696	245	511	52	4						29	103
Inland Natural Gas Co., Vancouver, B. C.	1000	200		800									
Intermountain Gas Co., Boise, Idaho	3500	1144		2118	35	20					50	25	30
Interstate Power Co., Dubuque, Iowa	606	421		80	7								14
Iowa Electric Light & Power Co., Cedar Rapids	2769	1198	163	1169	116						96		11
Iowa Illinois Gas & Electric Co., Davenport, Iowa	5481	2502	769	1730	92	141			4		38		48
Iowa Power & Light Co., Des Moines	1674	738	167	669	59				4		25		
Iowa Public Service Co., Sioux City	1548	450	160	515	10				8		190	3	44
Iowa Southern Utilities Co., Centerville	1601	1017	25	300	8	47					127		28
Kansas-Nebraska Natural Gas Co., Hastings, Neb.	3867	100	150	150		20						15	116
Kentucky-West Virginia Gas Co., Ashland, Ky.	2894			13								5	41
Kingston (Ont.) Gas Dept.	190	30	34	110					2		4		7
Knoxville (Tenn.) Utilities Board	195	106		48	5								8
Laclede Gas Co., St. Louis	12,262	2677	1147	4199	310	10	2	39			231	132	155
Lakeland (Ont.) Gas Dept.	1500	260		1000				100					
Las Cruces (N. M.) Gas Dept.	277	←				196					→	←	
Lone Star Gas Co., Dallas, Texas	32,028	4409	2261	2425	70						415	182	891
Long Beach (Calif.) Gas Dept.	3653	500	600	200	3		800	45	1	50		100	10
Long Island Lighting Co., Mineola, N. Y.	9900	4550	450	2340		25	925	85			100	175	175
Louisville (Ky.) Gas & Electric Co.	4904		2490		89						10	10	63
Louisiana Gas Service Co., Harvey	1406	552	100	601								25	42
Madison (Wis.) Gas & Electric Co.	938	402	254	233	30							6	11
Manchester (N. H.) Gas Co.	212	105	7	11	25						21	15	11
Memphis (Tenn.) Gas Dept.	4794	2243	435	521	55						182	40	170
Mesa (Ariz.) Gas Dept.	188	100	14	65	3			1					2
Metropolitan Utilities Dist., Omaha, Neb.	1966	816		835	79						49	20	67
Michigan Consolidated Gas Co., Detroit	29,795	7325	1595	7338	824	191	34					84	
Michigan Gas Utilities Co., Coldwater	1800	703	110	524	30	50			5	5		14	66
Michigan-Wisconsin Pipeline Co., Detroit	55,000											20	110
Mid-Georgia Natural Gas Co., Conyers, Ga.	190	65	1	25	2	1				1	1	1	2
MidSouth Gas Co., Little Rock	553	260	40	100	5	5		1	5		10	40	60
Midwestern Gas Transmission Co., Houston	50,815												
Milwaukee (Wis.) Gas Light Co.	11,716	3415	2321	4830		186					53	50	
Minneapolis (Minn.) Gas Co.	7706	2920		2702	71						9	31	241
Mississippi River Fuel Corp., St. Louis	250												40
Mississippi Valley Gas Co., Jackson	2244	505	305	894	15				2		15	17	94
Missouri Natural Gas Co., Farmington	657	261	70	150	7			4				2	14
Missouri Public Service Corp., Kansas City	580	156	194	208							22		
Missouri Western Gas Co., Butler	45			5									6
Mobile (Ala.) Gas Service Corp.	1141	530	27	523								27	34
Montana-Dakota Utilities Co., Minneapolis	3318	371	328	227	28					10	2	35	107
Mountain Fuel Supply Co., Salt Lake City	6500	←				3900					→	←	
Natural Gas Storage Co., Chicago	1497											1	29
Natural Gas Pipeline Co., Chicago	5967											58	163
Nashville (Tenn.) Gas Co.	1312	400		420	30						18	9	35
New England Elec. System, Boston	3799	2341	144	735	20	20			2			20	48
New Bedford (Mass.) Gas & Edison Light Co.	596	259	5	95	5	25	52	6				3	
New Britain (Conn.) Light Co.	688	378		85	30		115	5			10	23	12
New Haven (Conn.) Gas Co.	790	452	10	196	1			7			43	8	46
New Jersey Natural Gas Co., Asbury Park	3254	1130	183	1151	85						68	14	132
New Orleans (La.) Public Service Co.	2119	348	540	603	48						3	15	103
Newport (R. I.) Gas Light Co.	26	7	1	12							1	1	3
New Ulm (Minn.) Gas Dept.	64	20	27	5								8	2
New York State Electric & Gas Co., Ithaca	4170	1300	1171	1200								10	
North Carolina Natural Gas Corp., Fayetteville	18,526	←				3139					→		
North Central Gas Co., Casper, Wyo.	92	65		12	2						3	2	6
Northern Illinois Gas Co., Aurora	39,300	23,615		7090	230							90	565
Northern Indiana Public Service Co., Hammond	6872	965	492	1702	79	50		10	11	2		13	202
Northern Ontario Pipeline Crown Corp., Ottawa	13,000												
Northern States Power Co., Minneapolis	11,249	7835	168	2305	520				10				
Northern Utilities Co., Casper, Wyo.	198	142		28	4	1					3	5	10
Northland Utilities, Ltd., Edmonton, Alta.	2147	500	5	276								1	7
North Penn Gas Co., Port Allegany	490	44	33	48	4	15					28	15	80
Northern Indiana Fuel & Light Co., Auburn	110	28	28	44								2	1
Northern Natural Gas Co., Omaha, Neb.	35,000												
Northern Oklahoma Gas Co., Ponca City	2415	30	20	2								1	8
Northwestern Alabama Gas District, Hamilton	7			7									
Northwestern Public Service Co., Huron, S. D.	1092	405	178	368	37				9			8	15
Northwest Natural Gas Co., Portland, Ore.	4996	1850	1388	1329	78						83	16	40

GENERAL (In thousands of dollars)					PRODUCTION (In thousands of dollars)				STORAGE (In thousands of dollars)				TRANSMISSION (In thousands of dollars)					
Construction Equipment	Cathodic Protection	Communications	Buildings	Other	Drilling and Production	Gathering Lines	Field Compressors	Miscellaneous	Underground (Natural Gas)	LPG Plant	Mfg. Gas Plant	Miscellaneous	New Lines	Replacement of Lines	Compressor Stations	Pressure Control and Measurement Stations	Automatic Control Equipment	Miscellaneous
42	245		160						3305	129			60,016		6720	2000		450
57			18			13			223	6			25	90		7		
	25	25		30														
2	5		3										74					
11	5																	
113	28	16																
16	30	2	8	4						78	7							
23	11	3	15	20														
			7	6														
40	55	167	15	25	452	505	60	66	235				270	150	1231	45		
27		6	1	1	2134	575	35	18						10		1		27
1		2																
273			753	78				28	1758	497	1							
	81 →												130			10		
321	76	58	682	150	10,603	73	88	343	300				3386	770		637		3908
10	5	4										1325						
			850					25				200						
12	20	54	40	53					1010			11	1060	18		30		20
2																		
155	20	12	5	12														
			961															
3																		
2	20	16	42							20								
81	1		1070	128					11,124									
50	15	3	50										100	50	25			
	20	20		30									44,400			10,200	100	100
1	1	1	80	5										1				2
5	20		2										← 50815 →					
			806	53														
192		70	57	401						1012								
	80	20				10	40										60	
42	151	1	66	40					1	1				87		3	5	
4	20												125					
		3								23			8					
28	68	9	6	1	224	6		22	15				351	591	809	55	4	221
← 200 →					← 900 →								← 1500 →					
8		7							1249					20	182	1		
168	100	837		58	270	707	47	350						978		2206		25
				400														
8		2	46	91						150		172						
8			5							75	58							
6			4							20								
23				4														
60		15	1	3						100			385			5		
			381															
				1														
	2								144	345								
													← 15,387 →					
			1	1														
565			2145	2600					2400									
227	78	11	218						75	256	12		2208	96	90	30	45	
48										315	48				13,000			
			2														3	
5	3	2	41	12									1265			30		
			3		15	26		3	47					130				5
3			3	1														
		2	2		50								← 35,000 →					
													2300					
27	6		5	6						28								
35	84		51	56							8							

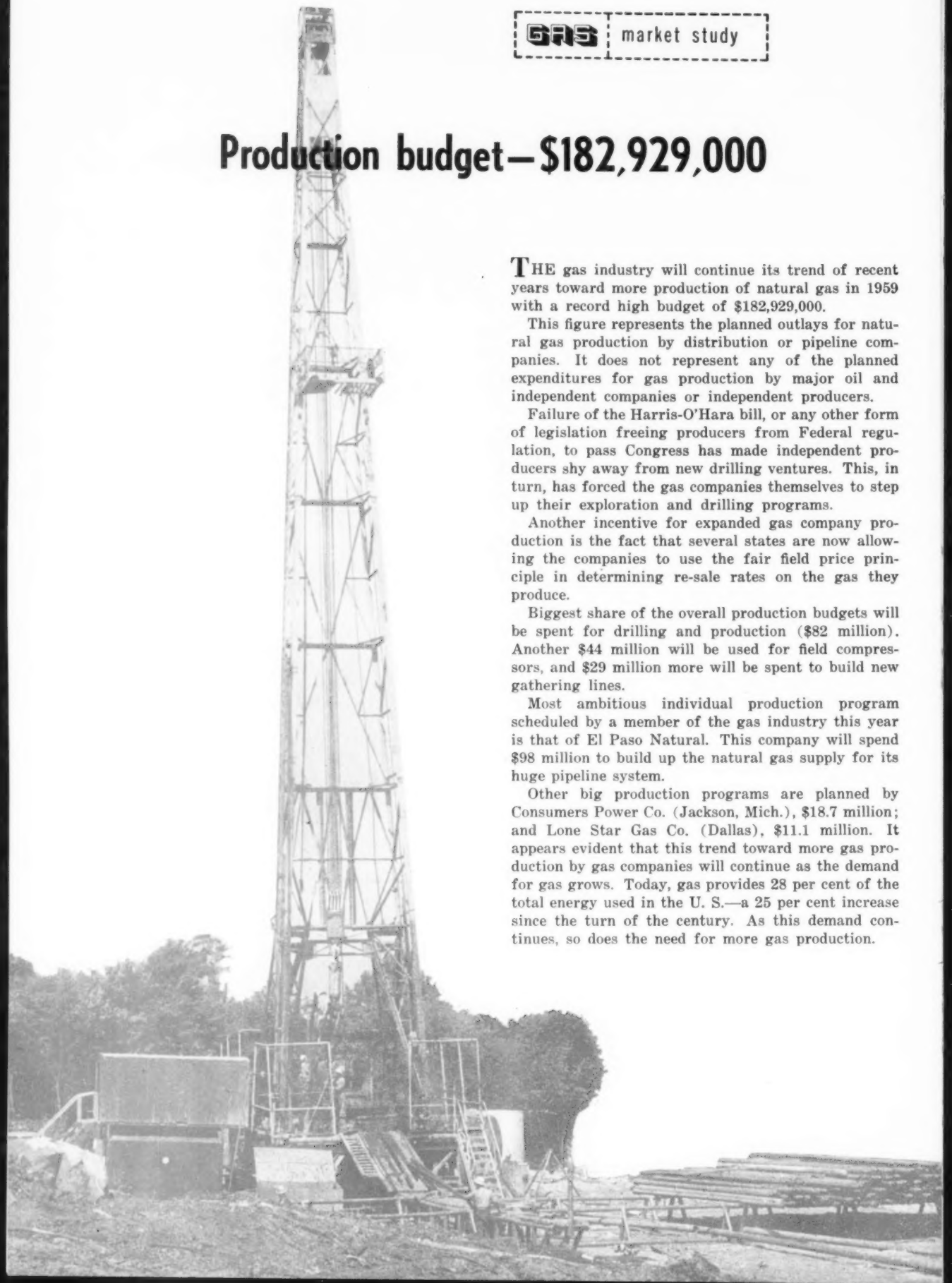
1959 budgets of 220 gas companies

COMPANY (In thousands of dollars)	TOTAL	DISTRIBUTION (In thousands of dollars)										(In thousands of dollars)	
		New Mains	Mains Replacement	New Meters and Services	Regulator Stations and Equipment	Measurement Stations and Equipment	Distribution Compressor Stations	Automatic Control Equipment	Odorization	Filtering and Cleaning Equipment	Miscellaneous	Office Systems and Equipment	Autos and Trucks
Northwestern Utilities, Edmonton, Alta.	5047	1020		1114	114	25					30	65	139
Norwich (Conn.) Gas Dept.	52	16	20	9							3		
Ohio Valley Gas Corp., Winchester, Ind.	127	38	17	50	8	5						3	6
Oklahoma Natural Gas Co., Tulsa	10,064	831	1598	781							231	156	302
Owatonna (Minn.) Gas Dept.	35	←				35					→		
Orange-Rockland Utilities, Inc., Nyack, N. Y.	1867	775	73	552	32						3	20	18
Pacific Gas & Electric Corp., San Francisco	34,992	5644	2774	9926	357	28	115	13			915		
Pacific Lighting Gas Supply Co., Los Angeles	25,014												
Pacific Northwest Pipeline Corp., Salt Lake City	11,808											44	
Palo Alto (Calif.) Gas Dept.	248	149	8	43	25								
Pennsylvania Gas Co., Warren, Pa.	2330	920		245	20	15					10	10	65
Peoples Gas Light & Coke Co., Chicago	16,529	4009		3823	85		505	55			798	130	441
Peoples Natural Gas Co., Pittsburgh	15,364	2232	851	1280	232						92	60	251
Peoples Gas System, No. Miami, Fla.	2580	812	11	718		160					797	6	37
Petersburg (Va.) & Hopewell Gas Co.	332	165	27	88								1	9
Philadelphia (Pa.) Electric Co.	8487	4632	552	1041	130							←	
Piedmont Natural Gas Corp., Charlotte, N. C.	6975	3794	1003	379	5	69	313	2			170	25	124
Pioneer Natural Gas Co., Amarillo, Texas	7127	1134	198	798	27				5			61	385
Public Service Co. of Colorado, Denver	11,076	3488	1480	3293	220						509	50	62
Public Service Electric & Gas Co., Newark, N. J.	29,640	9912	1035	6298	1553			155			6556	103	828
Quebec Power Co., Quebec	5	←				5					→		
Richmond (Va.) Gas Dept.	700	300	50	300								10	25
Richmond (Ind.) Gas Corp.	125		105	20									
Roanoke (Va.) Gas Co.	464	286	9	98	5					6	2	10	5
Rochester (N. Y.) Gas & Electric Corp.	5424	2251	626	2300	60						50		
San Antonio (Texas) Gas Dept.	4276	999	1500	1164	45			6	4		268	1	43
San Diego (Calif.) Gas & Electric Co.	4337	1294	690	1820		10					17	21	128
Saskatchewan Power Corp., Regina, Sask.	13,500	3140	25	1110	50	50			10		150	50	
Sierra Pacific Power Co., Reno, Nev.	350	55	105	95							12		4
South Atlantic Gas Co., Savannah, Ga.	1620	425	75	491							18	10	18
South Carolina Electric & Gas Co., Columbia	2106	1284		647									30
South Carolina Natural Gas Co., Columbia	3032												
South Georgia Natural Gas Co., Thomasville	2250											2	20
South Jersey Gas Co., Atlantic City, N. J.	1443	550	155	445							22	20	89
Southeast Alabama Gas Dist., Andalusia	126	45		66								2	6
Southern California Gas Co., Los Angeles	44,519	5519	3936	11,449	213							319	1281
Southern Counties Gas Co., Los Angeles	25,850	4501	2258	4984	48						2791	60	487
Southern Indiana Gas & Electric Co., Evansville	1362	421	100	427	48							4	35
Southern Natural Gas Co., Birmingham	31,000												
Southwest Natural Gas Co., Shreveport, La.	465	92	141	38	14	5						16	14
Springfield (Mo.) Gas Dept.	696	329	26	277	2			7			6	1	26
State Fuel Supply Co., Oklahoma City	125	15	35	13	6								7
Sugar Bowl Utility, Thibodaux, La.	188	150	10	20								3	
Superior Water, Light & Power Co., Superior, Wis.	403		15	34									3
Tennessee Gas Transmission Co., Houston	103,877												
Texas Eastern Transmission Corp., Shreveport	50,382											139	680
Texas Gas Transmission Corp., Owensboro, Ky.	56,300												250
Texas Illinois Natural Gas PL Co., Chicago	2216											8	110
Trans-Canada Pipe Lines, Ltd., Toronto	5500											308	108
Transcontinental Gas Pipe Line Corp., Houston	130,744												
Transwestern Pipeline Co., Houston	193,000												
Trunkline Gas Co., Houston	81,500												
Tucson (Ariz.) Gas, Electric Light & Power Co.	954	482	150	276							5		10
Union Light, Heat & Power Co., Covington, Ky.	888	315	250	230					8		30		50
UGI—Harrisburg Gas Division	1262	513	50	378	3	23	5				21	10	54
UGI—Lancaster Gas Division	678	335	100	168	3						32	6	18
UGI—Lehigh Gas Division	2474	932	222	368							66	46	83
UGI—Philadelphia Gas Works	10,018	3618	1157	2325	197						41	92	421
UGI—Reading Gas Division	1225	505	100	235								17	60
United Natural Gas Co., Oil City, Pa.	2569	←				665					→	←	
Virginia Electric & Power Co., Richmond	2986	1085	25	1050						7	2	9	57
Volunteer Natural Gas Co., Johnson City, Tenn.	128	85	3	35		1							3
Washington (D. C.) Gas Light Co.	15,600	5554	440	5122	326							100	352
Washington Natural Gas Co., Seattle	5500	1912	285	2270	42	12					835	12	84
Washington Water Power Co., Spokane	1788	788	26	946	6	15			3				
West Ohio Gas Co., Lima	1200	500		275	10							10	20
West Tennessee Gas Co., Jackson, Tenn.	179	50		60	1						68		
Western Kentucky Gas Co., Owensboro, Ky.	1760	420	100	533	9	9						29	46
Westfield (Mass.) Gas Dept.	90	80		5	5								
Wisconsin Natural Gas Co., Racine	2825	1861	843	120	9	25		25			25	1	65
Wisconsin Power & Light Co., Madison	1300	1000	100	150	50								
Wisconsin Southern Gas Co., Lake Geneva	658	275	192	135	4						3		24
Worcester (Mass.) Gas Light Co.	2500	1489	76	531	36								9
Wyoming Gas Co., Basin	80	25	12	9	3								5
York (Pa.) County Gas Co.	746	172	79	257	16			15			25	12	29
Company A	10,240	1106	1414	919	54	53					213	22	244

GENERAL (In thousands of dollars)					PRODUCTION (In thousands of dollars)				STORAGE (In thousands of dollars)				TRANSMISSION (In thousands of dollars)					
Construction Equipment	Cathodic Protection	Communications	Buildings	Other	Drilling and Production	Gathering Lines	Field Compressors	Miscellaneous	Underground (Natural Gas)	LPG Plant	Mfg. Gas Plant	Miscellaneous	New Lines	Replacement of Lines	Compressor Stations	Pressure Control and Measurement Stations	Automatic Control Equipment	Miscellaneous
65	30	13	410	5	1188	24		10										
2		1		1									694	20		16		65
2																		
115		16		500	1348			1810	604			529						
105		1	88										221	1073	141	8		
	96			170				38	7726				5002	599		1198		391
	198	64	275	50					5525				18,138	83	510			433
			8	380	5849	4603		240					1709		210	169	334	
	22			1														
35		20	310	10	150	40		30	330					63	15			42
98		7	274	2506									3798					
134		85	200		2119	1085	150	402	195				4850	812	36	111	187	
14	4	14									17							
8		10	11	13														
	1008			→														
76	30	38	332	196							351			748				25
110	4	18	380	19		494		113			420		921	1692	662	43		63
104		5	54	1311		470						1863		51		76	5	4
			1207	26														
10		5																
			30	2				1								9		1
25	130	10	81					137										
85	10	27	100	13						4		3				50		65
2		2				750		200	285				7680					
			56	27						75			500					
			3	30						110		2						
26			28										2915			117		
15		3	56					2					1812		287	75		
4													90			15	3	1
358	596		844	559					2025			186	14,177	1364	1560	133		
15	12		2370	72					40				7156	367				756
			8										242				10	
7	6		48										27,835		3000	165		
14			8	2								4	45	30		5		
													11	35				3
2		3		2						270			78					
		1											←		103,877			→
223	298	85	391	2440					8061				28,290		9310	485		
40	12	15		150		625			2000				43,500		8500	100		1160
		13		34									400	408	1191			
166	125	3	17						←	12,523		→	1590			2750		433
													←		118,221			→
													←		193,000			→
21			10										←		81,500			→
				5														
23	4	4	14	2					150									
3			6	7				8										
60			650					47										
465	1		388	67														
23		4	271	10							1161	85						
	374			→	←	287		→	←	509		→	←		834			→
			1							750								
122	1	34	612						2455	26	110	55						
	292																	
8	10			28							2							
4																		
15			40										315			15		
46	3	1	21	20	400	25			3				92				3	
				20														
			26	25														
				25														
3	15		36								325							
6																		
35	24	5	77															
129		82	4	49	2472	581	41	119	1043				1000	382	305	2		6

GAS market study

Production budget—$182,929,000



THE gas industry will continue its trend of recent years toward more production of natural gas in 1959 with a record high budget of $182,929,000.

This figure represents the planned outlays for natural gas production by distribution or pipeline companies. It does not represent any of the planned expenditures for gas production by major oil and independent companies or independent producers.

Failure of the Harris-O'Hara bill, or any other form of legislation freeing producers from Federal regulation, to pass Congress has made independent producers shy away from new drilling ventures. This, in turn, has forced the gas companies themselves to step up their exploration and drilling programs.

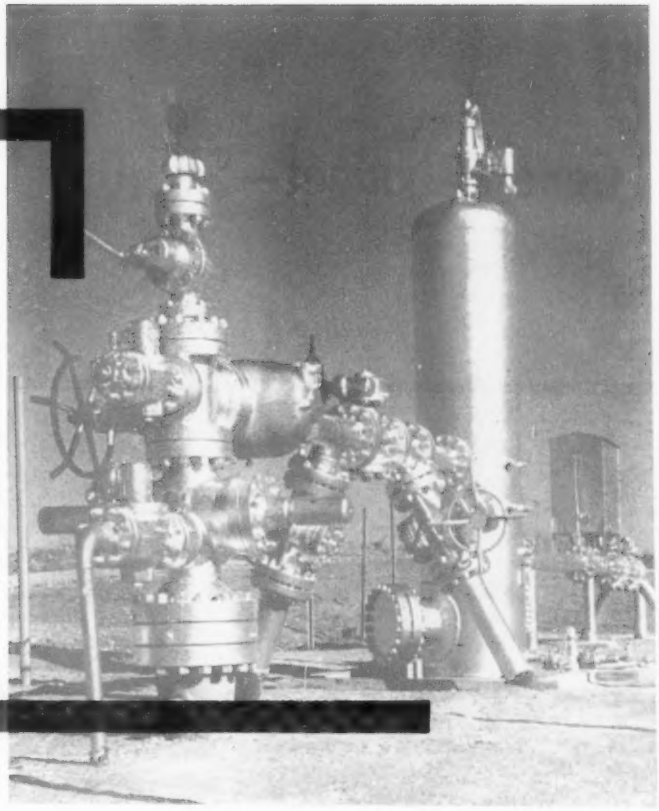
Another incentive for expanded gas company production is the fact that several states are now allowing the companies to use the fair field price principle in determining re-sale rates on the gas they produce.

Biggest share of the overall production budgets will be spent for drilling and production ($82 million). Another $44 million will be used for field compressors, and $29 million more will be spent to build new gathering lines.

Most ambitious individual production program scheduled by a member of the gas industry this year is that of El Paso Natural. This company will spend $98 million to build up the natural gas supply for its huge pipeline system.

Other big production programs are planned by Consumers Power Co. (Jackson, Mich.), $18.7 million; and Lone Star Gas Co. (Dallas), $11.1 million. It appears evident that this trend toward more gas production by gas companies will continue as the demand for gas grows. Today, gas provides 28 per cent of the total energy used in the U. S.—a 25 per cent increase since the turn of the century. As this demand continues, so does the need for more gas production.

Storage budget— $102,831,000



As peak day demands mount, so do the needs for storage facilities. That's why the gas industry, in 1959, will spend $102,831,000—another record high—on underground and other types of storage, LPG-air plants and LPG storage facilities, and manufactured gas plants.

More than half of this storage expenditure—$56 million—will be spent this year on underground storage alone. This type of storage has proved a life-saver for many a distribution company during its peak demand days.

Development of this type of storage has been rapid. In 1943, about 50 such fields were in operation, with a capacity of about 135 billion cu ft. Today, there are some 200 underground storage pools with a capacity of more than 2.6 trillion cu ft. Eight more pools are now under construction; they will boost this capacity by an additional 35 billion cu ft.

The underground facilities now in use represent an investment of about $553 million by the gas industry. AGA estimates that another $200 million will be spent on underground storage in the next three years.

This year, development of major storage areas will be carried on by both distribution and transmission companies. Biggest budget for this job has been set up by Transcontinental Gas Pipe Line Corp.—$12.5 million for its part in the Leidy and Tamarack storage fields in Pennsylvania. Anther partner in these same fields, Texas Eastern Transmission Corp., has $8 million earmarked for storage development.

Another straight pipeline company, Pacific Lighting Gas Supply Co. (Los Angeles), has $5.5 million budgeted for more underground storage facilities.

Distribution companies are getting into storage field operation in a big way, too. Detroit's Michigan Consolidated Gas Co. has $11 million to spend on it this year; it will develop two new fields, add compression at two existing ones.

Out California way, Pacific Gas & Electric Co. will devote $7.7 million to the development of the McDonald Island and Pleasant Creek underground storage fields. Illinois Power Co. (Decatur) has a $3.3 million project going.

Northern Illinois Gas Co., Southern California Gas Co., and Washington (D. C.) Gas Light Co. all have $2 million-plus underground storage budgets. A million dollars or more will be spent by Citizens Gas & Coke Utility (Indianapolis, Ind.), Laclede Gas Co. (St. Louis) and Louisville (Ky.) Gas & Electric Co.

The trend that started a few years ago toward installation of LPG-air plants and storage tank farms for peak shaving and stand-by use is also continuing. Actually, it is gaining momentum. Budgets for various forms of butane/propane-air plants and storage by the gas industry total more than $6 million. Among the major installations is an underground propane storage cavern being developed by Cincinnati (Ohio) Gas & Electric Co. Northern Indiana Public Service Co. (Hammond) also has an underground propane storage cavern project underway.

The more conventional LPG tank storage installations will be made by scores of gas companies this year, too. Leading this list is the $1 million project being carried out by Minneapolis (Minn.) Gas Co.

General budget—$83,009,000

Reprints of this survey are available from GAS Magazine, 198 S. Alvarado St., Los Angeles 57, Calif.

GENERAL expenditures in the gas industry this year will total $83,009,000. This category includes money budgeted for buildings, communications, autos and trucks, construction equipment, cathodic protection, office systems, and other miscellaneous items.

That the gas companies themselves are continually outgrowing their own facilities can be seen in the fact that more than $21 million will be spent this year for construction of new office buildings, operating centers, laboratories, and shops.

And, again in 1959, the gas industry will prove to be one of Detroit's best customers, as it will spend over $16 million for new automobiles and trucks. This is a $2.5 million increase over the $13.5 million spent annually for automotive equipment by the gas industry in 1956, 1957 and 1958.

A healthy $7 million of gas industry money will be used to buy new construction equipment this year. This new equipment will range from small ditchers for service lines to big-inch pipeline construction spread tractors, pipelayers, ditchers and draglines.

The necessity for maintaining efficient, fast billing and accounting operations again can be seen in the allocation of $4.6 million for new office systems and equipment. Much of this money will be spent for automatic data processing equipment.

Nearly $4 million will be spent by distribution and pipeline companies for cathodic protection.

New communications facilities (two-way radio, microwave, private wire lines, etc.) will cost the gas industry nearly $3.3 million this year. And, this figure could well be on the low side following the recent announcement by American Telephone and Telegraph Co. that it is planning to get out of the leased mobile radio business. Companies now leasing this equipment from the Bell system will soon be forced to make other arrangements—it is very possible that many of them will begin converting to their own installations during the year. ■

GAS market study

Author McCain (seated) discusses programming sequence of new problem for digital computer with chief engineer Howard M. Joiner (left) and J. B. Livingston, planning engineer.

How digital computer solves gas engineering problems

By HENRY J. McCAIN JR.
Engineering Department
The Peoples Natural Gas Co.
Pittsburgh

THE solution of gas engineering problems has never been an easy process. Within the past 10 years, however, vastly expanded distribution systems created by more and more customers have increased the number, complexity, and solving time of gas utility mathematical calculations.

About two years ago, The Peoples Natural Gas Co. began investigating the types of computers that could accurately and rapidly solve special engineering problems. These included: network distribution studies, traverse closure on lease descriptions, well and pipeline surveys, high pressure gas transmisson studies, and mechanical design of pipelines and compressor stations.

To suit the particular needs of the company, the computer had to possess the following qualities:

1. Relatively large storage capacity to handle large distribution network problems.
2. Rapid speed of calculation, since an iterative type procedure is necessary for the Hardy Cross solution of network problems and many calculations would be required.
3. Relatively easy to program, to eliminate the need for highly specialized computer operators.
4. Medium priced, to justify computer's use over prior methods of calculation.
5. Compact, to allow installation in the engineering department where results would be quickly accessible to concerned personnel.
6. No necessity for special air-conditioning.

At the time a digital computer was under evaluation, distribution network problems were being solved on an analog computer. Results were usually good, but few problems were solved because of the long time necessary to balance the electrical network used to simulate the gas network. The largest problem attempted contained only about 200 pipe sections and 75 loops. One run took about 7 days to complete. Adding new loads and improving the system by replacing some pipe sections took another 7 days. A smaller problem containing 44 pipe sections and 10 loops took about 12 hours. This problem was

later used as a test problem for the digital computer.

No calculations were made on survey problems. The distances and angles obtained from a survey or lease description were simply plotted, and if the sketch did not close properly, a notation to this effect was placed on the sketch. No attempt was made to balance the survey by applying any correction factor.

It was felt that a digital computer could be of value in solving both the distribution network and survey problems by giving more rapid and more accurate answers. In addition, it was anticipated that the computer would not be fully utilized with these two problems and other engineering problems could also be solved.

The computer finally selected was the Royal McBee LGP-30, and an order was placed.

The selection of a computer was only the first step in obtaining a device to speed engineering work. The next step was to train personnel to program and operate the computer. The author and Charles Brooks of the New York State Natural Gas Co. attended a two-week programming school conducted by Royal McBee in California. During this two-week period, the fundamentals of programming the LGP-30 were covered and sample problems were programmed and tried on the computer.

On completion of the two-week programming class, the distribution network problem was programmed using a modified Hardy Cross solution. The first program was completed in about two weeks and was tested on an LGP-30 computer at the Royal McBee office in Pittsburgh. This first attempt at programming required some "debugging" and, after slight modification, proved successful. The computer was delivered on December 20, 1957, and was placed in operation a short time later.

• Distribution network program

The distribution network program now being used is designed to solve either low pressure or medium pressure networks. Provision is made for cases in which regulators are to be maintained at different outlet pressures.

Preliminary work necessary for setting up a problem for solution includes reading route books to obtain the consumption figures for the area under study and preparation of a grid network diagram showing the pipe sections, sizes, and lengths. The distributed loads are grouped as concentrated loads at the pipe junctions, and an initial estimate of the flow in each pipe section is prepared. Pipe resistance factors are obtained by multiplying the length of each section of pipe by a constant for that particular size of pipe. These pipe constants are calculated using the Spitzglass formula for low pressure and Weymouth formula for medium pressure. The initial estimate of flow and the pipe resistance factors are then placed on punched paper tape which is used to load the data into the computer.

One more step is necessary before solution can begin. The program used to solve the network must have some means of identifying each pipe section in each loop; determining whether to add or subtract the pressure drop in each section as it calculates the algebraic sum of the pressure drops around each loop; and determining whether to add or subtract the correction factor from the flow in each section. This identification is made by means of a loop code which contains the pipe section number and a sign. The loop codes are also placed on punched paper tape.

The loop codes and data are then loaded into the computer and the program proceeds automatically. The program computes the algebraic sum of the pressure drop around a loop. If this pressure drop is greater than a previously assigned arbitrary value, the program computes a correction factor and applies it to the flow in each pipe section so that the loop will be balanced. The program then goes on to the next loop. If the pressure drop is less than the previously assigned value, the loop is considered balanced and no correction value is applied. After every loop has been checked, the program prints out the number of loops to which a correction factor has been applied and the sum of the absolute values of the correction factors. The program then goes through another iteration. When the computer makes a complete iteration without correcting any loops, the results are printed out. These results are printed out in three columns: pipe section number, flow (with its sign to indicate direction), and pressure drop in ounces (the difference of the squares of the absolute pressure if the problem is medium pressure).

These results are then used to calculate the pressures at each pipe junction by summing up pressure drops.

• Traverse closure program

The traverse closure program is designed to calculate the coordinates of the stations on a survey. Data necessary include the length of each course and the azimuth. If the distances given are slope distances, the vertical angles for each course are also needed. These data are punched on paper tape and loaded in the computer. The program can then follow several paths depending on what type of survey is being solved. Control of these different paths is exercised by the operator.

If the distances must be corrected for elevation, the program will calculate the sine of the elevation angle and multiply this by the distance to obtain the correct horizontal distance.

The program then calculates the coordinates of each station and stops. The operator then determines which path will be followed next. If the survey is an open survey, such that the actual coordinates of the final station are not known, the program will print out station number, N coordinate, E coordinate, distance and azimuth, and then stop. If the survey is a closed survey in which the final coordinates are known, the program will calculate the error of closure (the sum of the distances divided by the actual distance by which the survey fails to close) and prints this number out along with the actual error. If the error of closure is within a cer-

tain range (10,000 to 100,000) the computer will automatically continue and will correct the survey by apportioning the error according to the length and angle of each course. These corrected values are printed out just as in the open survey. If the error of closure is too small (less than 10,000), the computer will stop. The operator can then return to the beginning of the program to begin another problem, or, if desired, apply the corrections and print the results. If the error of closure is greater than 100,000, the operator then prints out the results. After the results have been printed, the operator can return to the beginning of the program for a new problem, or continue and calculate the area of the survey in acres using the double Meridian-Departure method.

• Advantages of digital computer solution

There are two advantages apparent in solving these problems on the digital computer—accuracy and speed.

The accuracy of the problems solved has proven excellent. The computer does not make mistakes if the program is correctly written and good data supplied. Naturally, bad data will result in incorrect solution of any problem. The accuracy of solution on network distribution problems has also been exceptionally good. As an example of this accuracy, results obtained on a study of existing conditions on the medium pressure system in Pittsburgh were practically all less than 1 lb different from actual pressures obtained by a pressure check taken on a cold day in January 1958. Low pressure problems have also checked out very closely.

The speed of solution is good. A 17-course traverse was calculated, balanced, and printed out in less than six minutes. The small distribution problem mentioned previously which had taken about 12 hours on the analog computer was solved in about 25 minutes. The problem which contained 200 pipe sections and 75 loops was solved in less than five hours on the LGP-30 as compared to seven days on the analog.

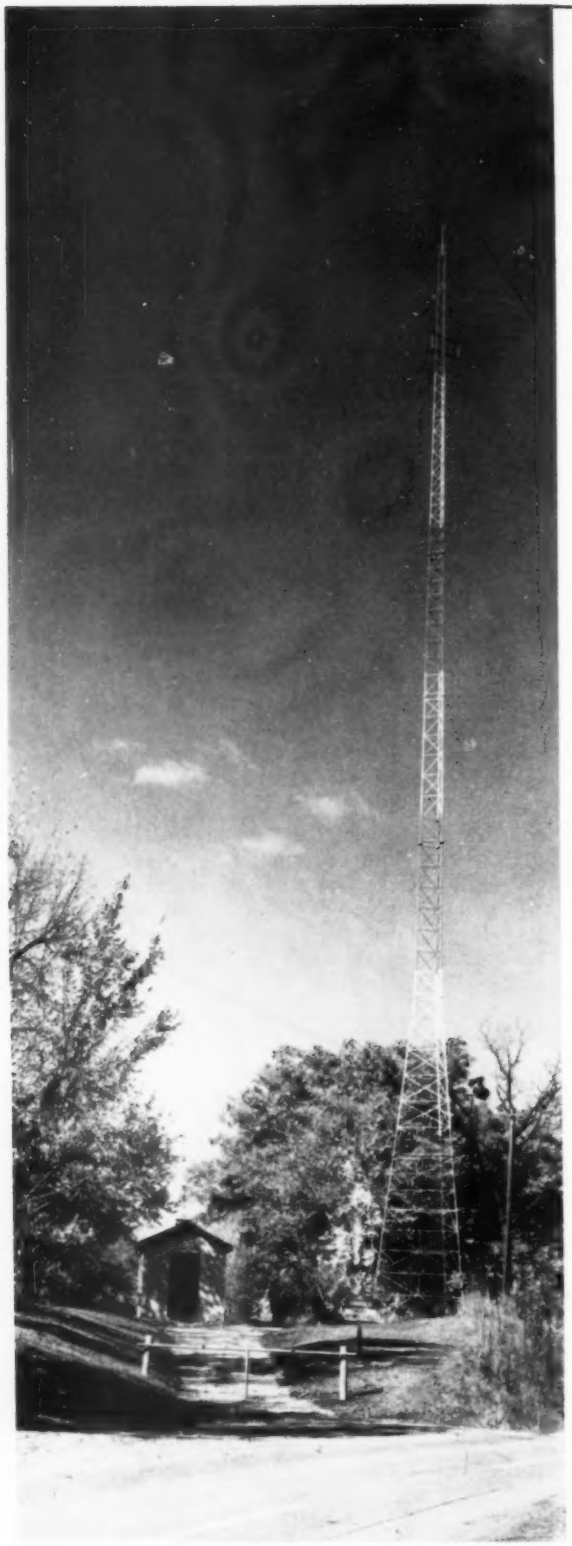
In addition to the apparent advantages of accuracy and speed, there are other advantages due to the speed of the computer. For example, a sufficient number of trials may be made to obtain the best solution for improving existing distribution facilities to adequately meet expected future loads. These different solutions may include the addition of new points of supply, replacement of existing pipe with larger pipe, running parallel lines, or tying different points together with cross connections. Since the computer runs automatically, the operator is free to prepare other problems for solution or to perform other duties.

Although the only problems now being solved on the computer are the distribution and traverse problems, others are being considered. Among these are high pressure gas transmission, mechanical design of pipelines and compressor stations, and gas reservoir calculations for storage and production wells.

It is difficult to assess a fixed dollars and cents value on the computer to the company. The use of the computer has saved time in the operation of the engineering department by eliminating the needless mapping of inaccurate surveys and by increasing the speed of mapping through the use of coordinates rather than distances and angles. It has speeded the work of the planning department by providing a means of obtaining fast and accurate answers to distribution network problems. It has provided a means of solving distribution problems that would otherwise not have been solved either manually or on the analog computer. On one large problem the computer enabled the planning department to find a better and less expensive solution for obtaining better distribution and pressures than the solution suggested by operating personnel in the field. This solution alone resulted in a considerable saving of money.

As other problems are programmed and solved on the LGP-30, better and more economical solutions will certainly be obtained. The computer has proven itself to be a worthwhile investment. ■

The LGP-30 is a compact unit located in a room immediately adjacent to Peoples Gas engineering department offices. Programming data are fed to computer through both typewriter keyboard and tape reader on left of typewriter.



GAS exclusive

Overcoming coordinating problems in a radio system

"ONE of the most complex utility systems in the country," is the way communications engineers describe Northern Illinois Gas Co.'s 2-way mobile radio network. The system operates in three frequency bands. It utilizes mobile repeater, selective signaling, single tone base station control, and tone coded squelch techniques, among others, to overcome design problems caused by necessary frequency cooordination.

Because of the coordinating problems encountered, the system design was the result of attempting to make the best possible use of available frequencies rather than one that would best suit the company's purposes if the coordinating problem did not exist. Simply, crowded channel conditions prevented our using desired frequencies.

While the system design is unusual, it has provided a workable system that enables communications by 10 operating districts or divisions stretching from Lake Michigan to near the Mississippi and from the Wisconsin line to near mid-central Illinois.

• System design

The network is basically two systems: the 450 mc. system, which consists of four base stations transmitting on 451.25 mc. with 130 associated mobile units transmitting on 456.25 mc.; the crossband system, which consists of eight base stations transmitting on 47.98 mc. with 233 associated mobile units transmitting on 158.19 mc. The location of the base stations and various control points is shown in *Fig. 1*. The entire network was supplied by Motorola.

The base stations of both systems are of the mobile relay type. This means the stations automatically retransmit all received signals. This enables long range mobile-to-mobile communications and enables use of operational fixed control stations at several locations. This technique is used when the dispatch point is too

By O. H. JOHNSON
Communications Engineer
Northern Illinois Gas Co.
Bellwood, Illinois

far from the repeater for practical use of wire line control. In essence, these operational fixed control stations can be thought of as tied-down mobile units, since they transmit on the mobile "transmit" frequency and receive on the base station "transmit" frequency.

All mobile units are equipped with selective calling decoding devices. This enables the base station operator, equipped with a "Quik Call" signaling console, to call either an individual car or the entire mobile group assigned to his station by sending out the proper tone codes. This feature eliminates the necessity of the mobile operator's monitoring all transmissions on the channel since he hears only those meant for him. By connecting the selective calling decoder to an auxiliary relay, the vehicle horn or an external light can be operated to alert the driver to a radio message when he is away from the vehicle.

The 450-mc. system is of rather straightforward design. The four base stations, serving the north division, eastern division, Joliet district and the Kankakee district are locally or wire line controlled. The low power characteristic of the mobile transmitters (20 watts RF power output) eliminates the danger of a mobile from one district capturing the base station in a neighboring district. This is not true in the crossband system. Here, the signal of the higher power 150-mc. mobile transmitter very easily crosses district lines and so can interfere with a number of base stations. This would mean one mobile could conceivably tie up several segments of the system.

To avoid this, each crossband system mobile transmitter is equipped with a single-tone generator capable of producing three different frequencies—1.8, 2.0, 2.2 Kc. A three-position selector switch on the dash control head controls this generator. Each crossband system base station receiver is equipped with a single tone decoding relay corresponding to one of the single-tone frequencies. This arrangement enables the

ABOVE: Appliance serviceman Dean Hamilton receives instructions from headquarters. BELOW: Charles Bentson dispatches to field via two-way radio from Ottawa district office (via tower on opposite page).

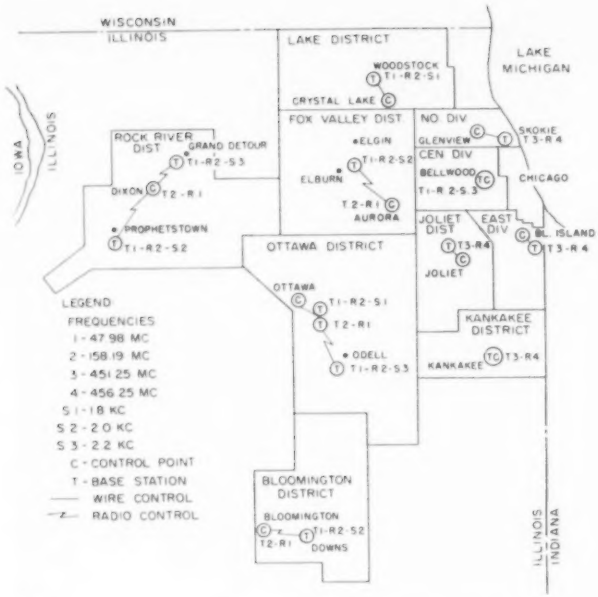


Fig. 1. Location of base stations and various control points.

New radio system causes new scene in parking lot.

mobile operator, by selecting the proper tone frequency, to call the base station to which he is assigned without disturbing adjacent base stations even though he is within transmitting range. The base station receivers ignore all those signals that are not preceded by the proper tone signal. Even though several stations in the entire system are controlled by the same tone frequency, they are spaced far enough apart so that only assigned mobiles can open the receivers.

For example, a mobile unit operating in the Fox Valley district cannot open the Prophetstown station receiver even though singletone decoder is responsive to the same tone frequency as the Fox Valley Elburn station. Distance is the protective factor.

Several types of controls are used to operate base stations located a great distance from the dispatching point. *Fig. 2* shows the method used in the Rock River district, which has two repeater stations controlled by one operational fixed control station. The operational fixed station (think of it as a permanent mobile) at Dixon is equipped with a singletone generator which enables selection of either the Prophetstown or Oregon station repeater, depending on which area of the district the dispatcher wishes to cover. Mobile units in the district select the closer station and identify their location so the dispatcher can reply through the proper station.

The Ottawa district, shown in *Fig. 3*, also has two repeater stations and one operational fixed control station. However, the method of operation and control differs from the Rock River district in that the fixed control station is located at the same site as the Ottawa repeater. This site is about two miles from

Close-up of two-way apparatus in one of NI-Gas vehicles.

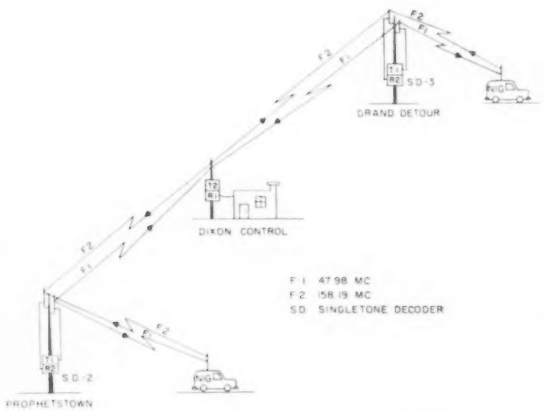


Fig. 2. Controls used in Rock River district.

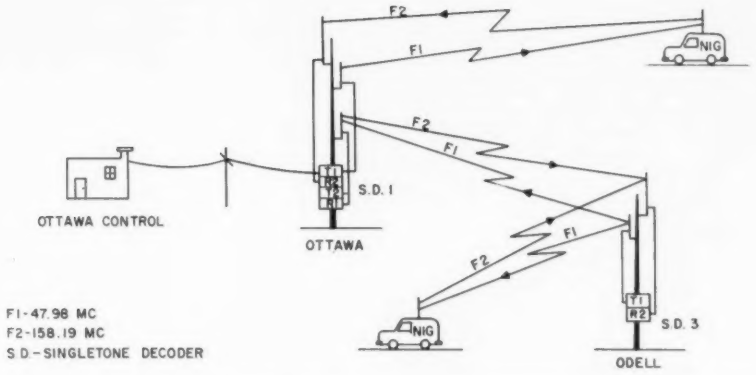


Fig. 3. Ottawa district.

the dispatching office and connected to it by wire lines. The dispatcher uses the operational fixed station only when he wishes to use the Odell repeater. Otherwise he operates the Ottawa repeater directly through the wire line connection. A selector switch on his console determines the mode of operation.

The Fox Valley installation, shown in *Fig. 4*, consists of one base station repeater at Elburn and one operational fixed control station at Aurora. The Aurora dispatcher controls the Elburn repeater during daytime operation and also the Woodstock repeater in the Lake district during the night. Station selection is made by singletone frequencies. This arrangement could cause complications since the Aurora fixed control station can be reached by both the Elburn and the Woodstock repeaters. During the day time, this pickup of the Woodstock receiver repeater signals would be annoying interference. To avoid this, the Aurora control station receiver is a tone coded squelch model, known as "Private-Line" radio. This technique blocks out the audio circuitry of the receiver unless the signal is accompanied by a continuous, inaudible tone signal. The transmitter in the Elburn repeater is equipped with the necessary "Private-Line" radio tone generator. In this manner Woodstock signals are blocked out. The private line control of the Aurora receiver is turned off at night when the Woodstock repeater is controlled from this dispatch point.

The Northern Illinois Gas Co. installed 2-way radio to enable faster dispatching of repair crews so as to provide greater safety to the general public and to provide better service to the company's customers. The company's operating functions are divided among three specific departments: (1) appliance repair, which is responsible for setting commercial and residential meters; turn-ons and turn-offs; adjusting appliances and all work normally performed on the customer's premises; (2) street department, which normally installs new services and mains and is responsible for maintenance and replacement of mains and services; (3) pressure department, which is responsible for the operation of the system, maintenance of regulators, and installation and maintenance of large industrial meters.

The use of 2-way radio aids all three departments in closer scheduling of routine tasks and fastest action possible during emergencies. With it, new highs in operating efficiency and productivity as well as improved safety and service capabilities are achieved. ■

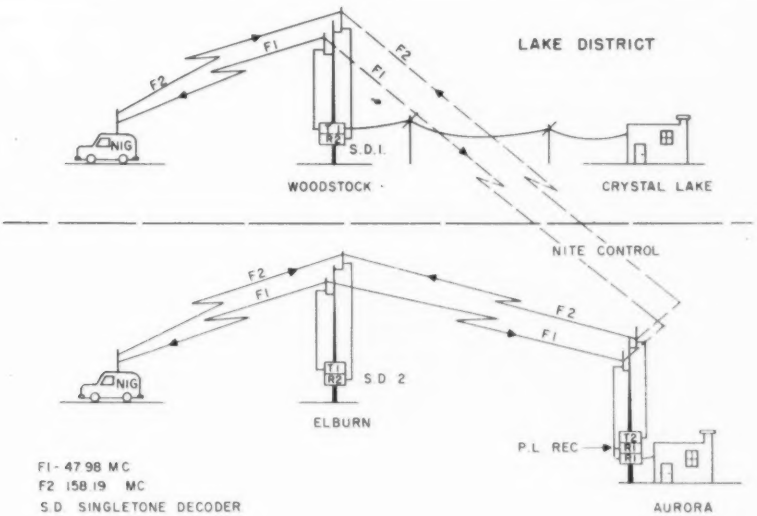


Fig. 4. Fox Valley district.

Taping tees . . .

ABOVE: Prior to taping, pipe putty is applied to all shoulders and irregular surfaces. If main is mill coated, void at base of tee is filled with putty. BELOW: Two-inch wide vinyl tape is applied over compression nut, around tee saddle and around tee elbow junction. Enough tension is used on these and succeeding wraps to get a conformable, wrinkle-free surface. Strips of tape are placed over putty on main at base of tee.

Tape wrapping pipe fittings

As the use of plastic tape to prevent corrosion in underground distribution pipe grows, simpler, more easily followed and improved methods of taping particular shapes have evolved.

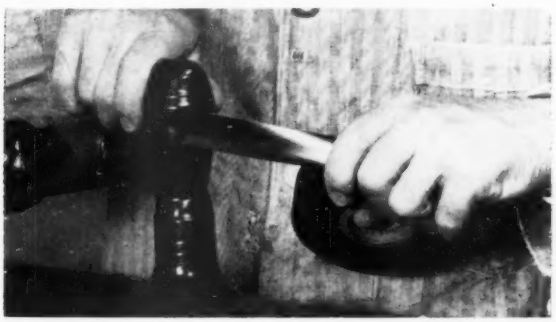
Field experience in applying pressure-sensitive tapes has shown that problems exist in tape wrinkling and buckling, causing undesirable voids.

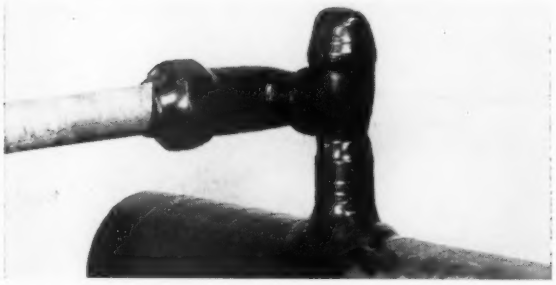
Using the experience of those applying the tape in the field, Minnesota Mining & Manufacturing Co. has developed new methods of wrapping which incorporate a specially designed pipe putty to provide a smooth wrapping surface by eliminating voids in irregular fittings. By causing pipe putty to round out sharp corners on couplings and other fittings, wrinkles and folds can be eliminated.

Shown on this and the following pages are some accepted methods for protecting typical pipe fittings encountered in nearly every distribution layout. The material used was "Scotchrap" brand pipe insulation and pipe putty. ■

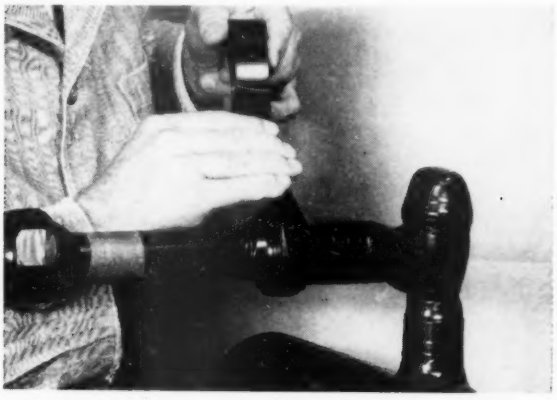
LEFT: Two-inch tape is unrolled and end split for about 4 in. (depending on tee size). Bottom or "V" end of split is placed at base of tee and flaps wrapped around tee base over putty. LEFT BELOW: Tape is brought around under main and over putty on one side of tee, around main again and over putty on other side of tee, and once again around main and up to back of tee. About 4 in. of tape is left above tee base and tape is cut. BELOW: Protruding 4-in. end is split and flaps wrapped around base of tee, completely covering tee base and putty. Taping of main can be done at this point or after tee wrap is completed.

ABOVE: To tape plug, plug is rounded off with putty and a 6-in. long piece of 2-in. tape is centered over top and snugged down. BELOW: Using 1-in. tape, start at base of tee and wrap up stem to tee saddle. Wrap over saddle in an "X" pattern and continue up stem until first piece of tape is completely tied in. Then wrap down stem again to saddle.





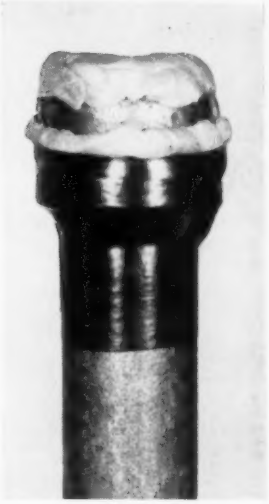
ABOVE: Bring tape around saddle and wrap along elbow to top of compression nut. BELOW: Using 1-in. tape, next serving starts on service and is wrapped to compression nut. Wrap is ended on flat surface of nut, completing tee-wrap.



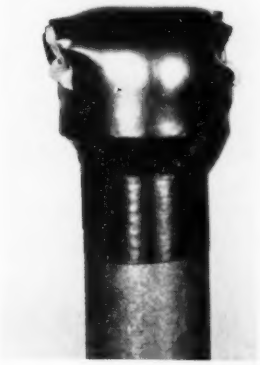
Taping a cap . . .

LEFT: Pipe putty is applied to top and shoulder of cap.

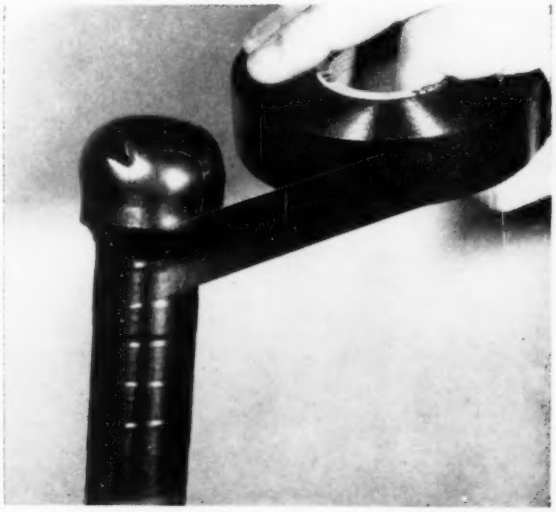
BELOW: Using 2-in. tape, a single wrap is made around tap-tee connection. Enough tension is used to assure a wrinkle-free surface.



BELOW: A 2-in. wide strip of tape is placed over cap and pulled tight for a smooth surface. This strip of tape should be long enough to go slightly past middle of previously applied strip.

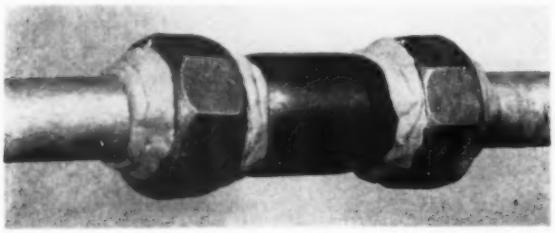


BELOW: A second piece of 2-in. tape is placed perpendicular to first to enclose top of cap. Then 1-in. tape is used to wrap from bottom up and over cap and back to bottom of stem. If stem includes a tee, tee is wrapped with the "X" pattern previously described.



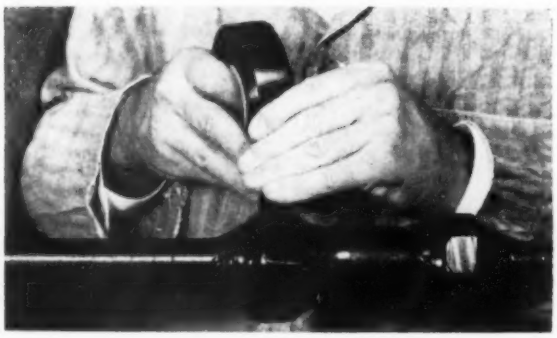
Two methods of taping couplings

1. Pipe putty is applied to shoulders of coupling nuts to provide a smooth taper down to pipe and coupling barrel.

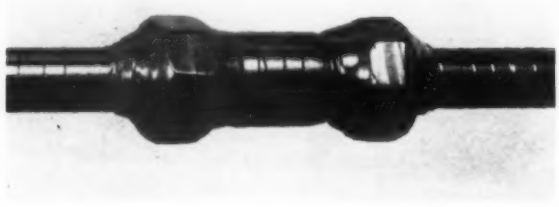


2. Next, 2-in. tape is applied to each side of each coupling nut, covering nuts and putty.

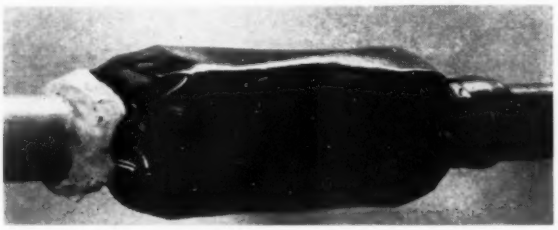
3. One-inch tape is used for final wrap, starting on service side of each nut and wrapping to center of coupling barrel.



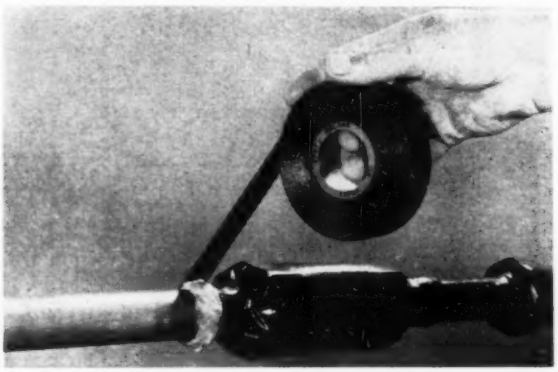
4. Completed coupling looks like this.



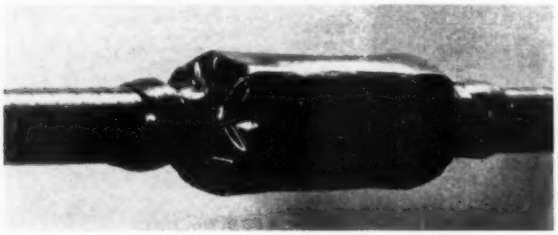
1. To protect coupling with a "cigarette" wrap, pipe putty is applied to service pipe about 1½ in. from coupling nuts. Edges of a wide width of tape are centered in two rings of putty. Width of tape is governed by coupling size.



2. Tape is joined, adhesive to adhesive, and folded down to form cigarette wrap. Tape edges are pressed into putty and putty is molded up over tape. Additional putty is used here if necessary.



3. Using 1-in. tape, ends of wide wrap are tied down into putty ring. Tape is then wrapped down service on either side of coupling.

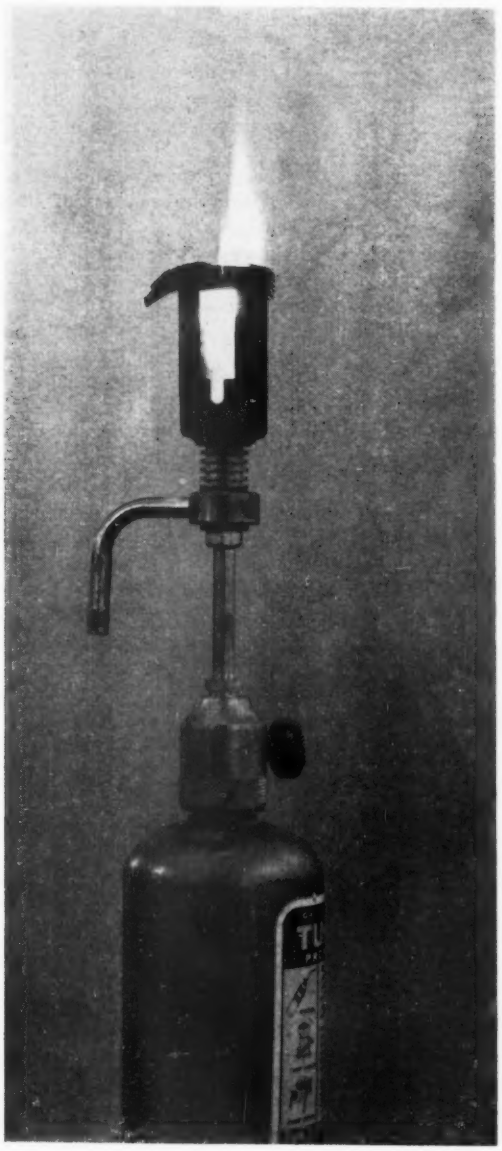


4. Completed cigarette wapped coupling looks like this.

BROOKLYN DEVELOPS NEW METHOD OF

Locating leaks on new main construction

By J. G. SWEENEY, Chief Chemist
Brooklyn (N.Y.) Union Gas Co.



A SIMPLE, dependable test has been developed by The Brooklyn Union Gas Co. for locating leaks in new main construction before gas is supplied to the mains.

The laying of mains in large cities presents numerous problems. It is essential and often demanded by local authorities that a newly laid main be backfilled as quickly as possible. Consequently there is no opportunity for determining visually whether leaks exist at joints, valves, etc. All leak detection tests must therefore be made after the main has been backfilled and also after pavement restoration.

Over the years, Brooklyn Union has been concerned with finding a suitable method for locating the exact position of leaks in new main construction after air or water pressure tests have shown the probability of leaks. Considerable success has been obtained by introducing carbon tetrachloride or trichlorethylene vapor into the main with the air used for pressurizing and then by testing barholes at each joint and fitting for

Halide detection lamp showing copper screen to hold sample under test. A brief green coloration of flame indicates presence of halide absorbed by carbon.

the presence of Halide which might have leaked out with the pressurized air. Trichlorethylene is preferred to carbon tetrachloride for this purpose because the former is considerably less toxic. Also a suitable rig equipped with storage tank and sight glass should be provided to enable observation of the dropping rate of trichlorethylene into an evaporation reservoir. Only trichlorethylene vapor should be introduced into the pumped air and this should be done during the whole pumping period. It is necessary that air flow through the far end of the section under test should continue until the presence of halogen in the outlet air is established. After that the air pressure can be built up. The important part of this procedure is a very sensitive method of detecting traces of chloride in the barhole air.

Equipment used for forming copper screen baskets. A blank, a finished basket, and the wood mold are shown. A box containing 12 activated carbon tubes for adsorbing the halide in the barhole atmosphere is also shown.

In 1950, when the first natural gas supply pipeline was being installed in Brooklyn, a halide leak detector was tried out for testing the barholes over the welded joints. This detector was a small portable electronic device which in field use required a portable 110-v a.c. generator. The instrument proved to be not selective enough for halides and its readings were affected by extraneous substances such as car exhaust fumes and cigarette smoke.

We then tried out and later purchased a different halide meter, an instrument designed specifically to analyze air containing halogenated hydrocarbons in a concentration ranging from 0-500 parts per million. This halide meter is a ruggedly constructed, fairly heavy piece of apparatus requiring, in the field, a 110-v a.c. current which is supplied by a portable Homelite generator powered by a gasoline engine. Since this assembly is quite heavy, a small dolly or cart was required to move it from one barhole to another.

The principle of operation is as follows: The intensity of the blue lines of the copper spectrum produced in an electric arc between two copper electrodes is continously measured with a photoelectric photometer using a blue sensitive phototube fitted with a blue glass color filter. Halide vapor coming in contact with the hot tip of the copper electrode reacts to form a copper halide, which vaporizes at the temperature of the electrode and is carried into the air. The intensity of the blue spectrum is in proportion to the concentration of the halide vapor present. By referring to a calibration curve, the meter reading (0-50 micro amperes) is interpolated in ppm. This method of quantitative determination of the halide in the atmosphere in the concentration specified, namely 0-500 ppm, was highly successful. The initial test requires a warm-up period of five minutes and each succeeding test can be made in two minutes.

Certain disadvantages became apparent however. Both the halide meter and generator with the cart had to be brought by truck to the site of testing and in the evening returned by truck for storage. This meant time lost for testing purposes. Both the halide meter and generator required considerable amounts of attention. At times one or the other, or both, were inoperable. This resulted in time lost for repairs. There was another disadvantage which could not be ignored. A barhole contaminated by combustible gas could not be safely tested. The atmosphere sample from any barhole to be tested is drawn into the instrument by means of a diaphragm pump and then is passed into a high frequency arc. An explosive mixture of gas and air ignited by the arc would damage the instrument. Therefore, some other method for testing gassy barholes had to be devised.

In our search for a simpler and more practical field test for halides we remembered a method outlined in the Bureau of Mines Phamphlet R. I. 3697, April 1943, "A Simple Device of Detecting Small Concentrations of Organic Halide Gases in the Atmosphere." The basis for this method is the ability of activated charcoal to remove traces of halide from air when the air is drawn through a tube containing a layer of charcoal. The charcoal, with even trace amounts of adsorbed halide, will give a characteristic green color to a colorless flame when heated to a glow in a copper screen basket. However, our field trials with this method, run about 10 years ago, were rather unsatisfactory. The results were not always conclusive and on a brilliant sunny day it was difficult to see the green color. Since an alcohol burner was used for heating the charcoal, the operation of this burner out of doors left much to be desired.

We also investigated the possibility of using a standard halide leak detector, which is a unit used by refrigerator servicemen for locating leaks of Freon or methyl chloride and is readily obtained from a refrigeration supply house. This halide unit is essentially a propane gas burner equipped with a short chimney to furnish a slight pull on the primary air supply that

is obtained through a nipple in the base of burner to which is attached rubber tubing for sampling. A copper ring which is installed in the burner and which is heated by the gas flame gives a green color to the flame if halide vapor is present in the primary air. The burner gets its gas supply from a cylinder of the throw-away type. The halide leak detector did a good job in the laboratory but failed in the district when the primary air was obtained from a barhole.

Method of sampling barhole atmosphere showing ⅜-in. copper tubing, stopper for barhole, charcoal tube (arrow), and rubber tubing with aspirator bulb.

We then made tests using small glass tubes filled with activated carbon to adsorb the halide traces from the barhole atmosphere, and an adaptation of the halide leak detector to produce the green flame color by heating the exposed carbon in a small copper screen basket installed in the burner. Much to our surprise we found that most of the activated carbons available gave the characteristic green copper halide color even though they had not been exposed to chlorinated hydrocarbons such as trichlorethylene. Only after considerable search were we able to find a suitable source of activated carbon. This happened to be the activated carbon supplied in convenient sealed glass ampoules by the U. S. Safety Service, Kansas City, Mo., at a cost of about 23 cents each. The tubes are called Flue Gas Filter Tubes for Saf-Co-Meter carbon monoxide determinations. With the use of these carbon tubes and the heating on the halide burner, 25 parts per million of halide can easily be detected in air.

As finally worked out, Brooklyn Union Gas Co.'s method for locating leaks on new main construction is as follows: The air which is being pumped into the section of main to be tested is supplied with trichlorethylene vapor, as described above, so that the resulting compressed air has at least a halide concentration of 1000 ppm. Barholes are made at all joints and fittings in the main. A ⅜-in. copper probe, the length of which depends on the depth of the barhole, is connected with a short piece of rubber tubing to the charcoal tube, which is, in turn, connected to an aspirator bulb. The atmosphere in the barhole is aspirated through the charcoal by squeezing the 100-cc aspirator bulb at least 25 to 30 times. A separate charcoal tube is used for each barhole and the tube is carefully labeled as to location. One dozen tubes are received in convenient cardboard boxes measuring 5½ x 2 x ¾ in. These same boxes protect the tubes before they are used and then serve as filing cases until they are brought back to an inside location for testing. The carbon contents of each tube is dumped separately into the red hot copper screen basket and if halide is present the characteristic green color will be imparted to the flame of the halide detector burner. This final test can be run in the field if preferable, since the burner and cylinder are readily portable and can be operated in the back of a panel truck to shield the burner from drafts and bright sunlight.

The apparatus needed for this test is quite inexpensive. The halide detection lamp, manufactured by Turner Brass Works, Sycamore, Ill., costs approximately $8 and the copper tubing, copper screen wire and activated charcoal are easily obtainable. All equipment that is required for sampling and testing can be easily transported by one man and no maintenance other than the making of copper screen baskets is required.

By means of this new halide detection method two very difficult leaks were located in the construction of a high pressure pipeline in Brooklyn and Queens. Neither of these leaks was at a joint weld where the barholes were drilled through the soil. In this case it was necessary to pressurize the air to as much as 500 psi to spring the pipe enough to let sufficient air escape for detection of its halide content in the barholes several feet away from the minute leaks. The availability of this leak detection method saved very extensive excavation and pavement removal. ■

ACKNOWLEDGMENT

The auther wishes to express appreciation of technical assistance to J. F. Anthes, M. Bermann, and C. Carnes, of the Brooklyn Union Gas Co. laboratory department.

GAS · DISTRIBUTION NEWS

Texas legislature gets utilities commission bill

Creation of a statewide public utilities commission to regulate gas, telephone, and electric power companies has been proposed by a bill introduced in the Texas legislature.

The measure would set up a three-member commission to regulate rates and other services.

Baytown City Attorney George Chandler, who helped draft the proposal, said that while the state railroad commission now reviews disputes between cities and natural gas companies, "rates are now unregulated outside the cities and hardly regulated within cities."

The proposed commission would have the power to inspect utility corporation books on demand and to require the filing of information and reports. The commission would be financed by utilities through payment of a quarterly assessment of ¼ per cent of their gross receipts for the preceding quarter.

The measure also sets forth how a rate base shall be arrived at in evaluating the property and assets of utilities for rate making purposes. The company would have to furnish the commission a list showing the original cost of all properties, materials and equipment. They would also furnish the amount of accumulated reserve set up for depreciation of such properties and equipment. The commission would subtract from the total original cost a figure not less than 50 per cent nor more than 75 per cent of the reserve, for depreciation. The remainder would constitute the rate base.

Whirlpool's modern gas kitchen going to Moscow

The peoples of the USSR will have their first look at a modern American kitchen this summer when a complete RCA Whirlpool gas kitchen goes on display at the American National Exhibition in Moscow.

Selected by the U. S. Departments of State and Commerce, the Whirlpool Corp. will show and demonstrate a kitchen similar to the Mrs. America kitchen currently being displayed by utilities and appliance dealers.

During the six weeks of the exhibition, which starts July 4, the kitchen will be located in the model American urban dwelling to be constructed in Moscow's Sokolniki park.

In operation will be Whirlpool's gas refrigerator, combination washer-dryer, built-in gas ovens, counter-top range and griddle.

Whirlpool's electronic Miracle Kitchen also will be on display.

Producer troubles blamed on depressed gas prices

Many of the troubles confronting U. S. oil and gas producers are caused "not so much by the fact that they are selling two competing forms of energy, but that they are forced to sell one—natural gas—below its true market value because of artificially depressed prices."

This is the conclusion drawn by Gulf Oil Corp. economists W. B. Davis and J. L. Schweizer in a paper presented before the recent annual meeting of the American Institute of Mining, Metallurgical and Petroleum Engineers.

In their paper, "Natural Gas—Partner and Competitor," the economists pointed out that in spite of the sharp increases in the real costs of finding and developing gas and oil in the United States, the producer is getting no more revenue per unit of product than he was in the depression days of the early 1930's.

This is true as regards natural gas because of the Phillips decision, and has resulted in halting the trend of gas prices to seek their natural economic level in a competitive market.

Since 1954, gas prices have barely managed to keep up with inflation.

The authors' purpose in writing their paper was to stress the fact that gas is much more than just a source of additional revenue to the crude oil producer.

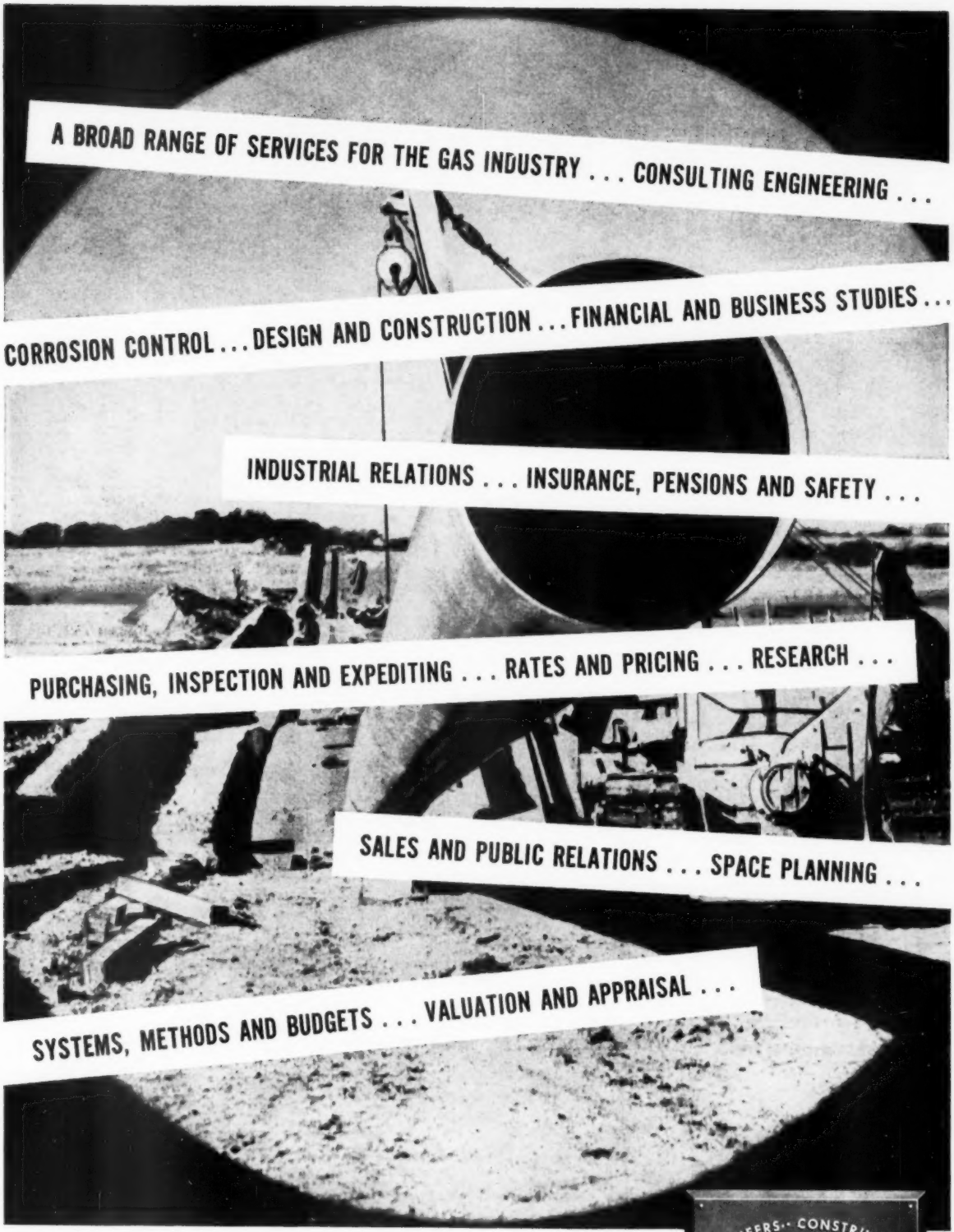
While a small fraction of crude oil is used to make lubricants and for chemical feed stocks, most of it is used as a source of energy. Natural gas, along with coal and other energy fuels, also serves the U. S. energy market. Consequently, gas is a competitor to crude oil at the consumer level, and the supply and price of natural gas are having a significant effect on crude oil demand.

"There is some question as to whether natural gas now is more important to oil producers as a source of revenue or as a competitor, Davis and Schweizer point out. "However, it is reasonably certain that if artificial control of gas prices continues, the importance of gas as a competitor will grow much faster than its importance as a revenue source."

For many years, gas has grown steadily as a source of revenue for the producer. In 1922, the value of gas at the wellhead, including royalty payments, totaled about $85 million in the U. S. This was less than 9 per cent of the total value of petroleum production that year.

Gas revenue has grown faster than oil. And, by 1958, the well-

Whirlpool's Mrs. America gas kitchen will travel to Moscow this summer as part of the American National Exhibition. This will be the first official U. S. government display ever held in the Soviet Union.


A BROAD RANGE OF SERVICES FOR THE GAS INDUSTRY . . . CONSULTING ENGINEERING . . .
CORROSION CONTROL . . . DESIGN AND CONSTRUCTION . . . FINANCIAL AND BUSINESS STUDIES . . .
INDUSTRIAL RELATIONS . . . INSURANCE, PENSIONS AND SAFETY . . .
PURCHASING, INSPECTION AND EXPEDITING . . . RATES AND PRICING . . . RESEARCH . . .
SALES AND PUBLIC RELATIONS . . . SPACE PLANNING . . .
SYSTEMS, METHODS AND BUDGETS . . . VALUATION AND APPRAISAL . . .

For a complete outline of the services Ebasco offers, send for "The Inside Story of Outside Help." Address Ebasco Services Incorporated, Dept. F., Two Rector Street, New York 6, N. Y.

ENGINEERS · CONSTRUCTORS
EBASCO
BUSINESS CONSULTANTS

NEW YORK • CHICAGO • DALLAS • PORTLAND, ORE. • SAN FRANCISCO • WASHINGTON, D. C.

head value of natural gas amounted to about $1300 million, or 15 per cent of the total value of produced petroleum. The 1958 value of natural gas was equal to or greater than the value of crude oil produced domestically in all but three years prior to 1939.

Gulf's economists predicted that the change in distribution of energy consumption among fuels from 1958 to 1970 will be about as follows: Crude oil, 42 to 44.5 per cent; natural gas, 27 to 30.5 per cent; coal, 24.1 per cent to 18.2 per cent, and water power, 3.8 to 3.7 per cent.

Remington Rand's new Univac computer, the world's first solid-state data processing system made available to business management, will be installed in October at New Jersey Natural Gas Co.'s computer center.

THE *FINEST* FOR MODERN GAS DISTRIBUTION SERVICE

NORMAC

Malleable Couplings

Normac Insulating Malleable Couplings and fittings are available with polyethylene inserts and semi-insulating gaskets or full insulating rubber gaskets.

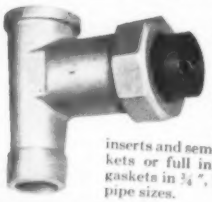
Insulating Couplings AND Fittings

Malleable Service Ell

The insulating principle depicted above is carried out in all Normac Ells and Tees.

NORTON McMURRAY has specialized for 20 years in the development and production of products solely for the Gas Industry. Whether your plans include modernization, or new, expanded facilities, Normac Gas Distribution Equipment will serve you well.

Brass Fittings



Normac insulating Brass compression end Tees, Ells and all compression end fittings are available with polyethylene inserts and semi-insulating gaskets or full insulating rubber gaskets in ¾", 1" and 1¼" iron pipe sizes.

Insulating Gaskets

The Normac insulating principle incorporates an efficient combination of a polyethylene sleeve and a semi-insulating gasket or full rubber gasket and retainer ring.

New CATALOG

Write for your copy . . . it gives complete details and specifications of NORMAC equipment.

NORTON-McMURRAY Manufacturing Co.

919 North Michigan Avenue

CHICAGO 11, ILLINOIS

Couplings • Meter Bars • Sleeves • Cocks • Ball Joint Clamps • Service Tees and Ells

Appliance observation program launched

Reduced appliance service calls and increased customer acceptance of gas appliances is the goal of a new cooperative program of gas utilities throughout the country.

After a year of limited tests by the AGA customer service committee and the operating section, the American Gas Association introduced its National Appliance Field Observation program. The AGA Labs in Cleveland will conduct the program under the supervision of the operating section committee.

The program is designed specifically to identify common causes of service calls by collecting and analyzing field observations reported by gas company service departments. AGA will seek to stimulate product improvement by referring its findings to appliance manufacturers and its own approval requirements and research committees.

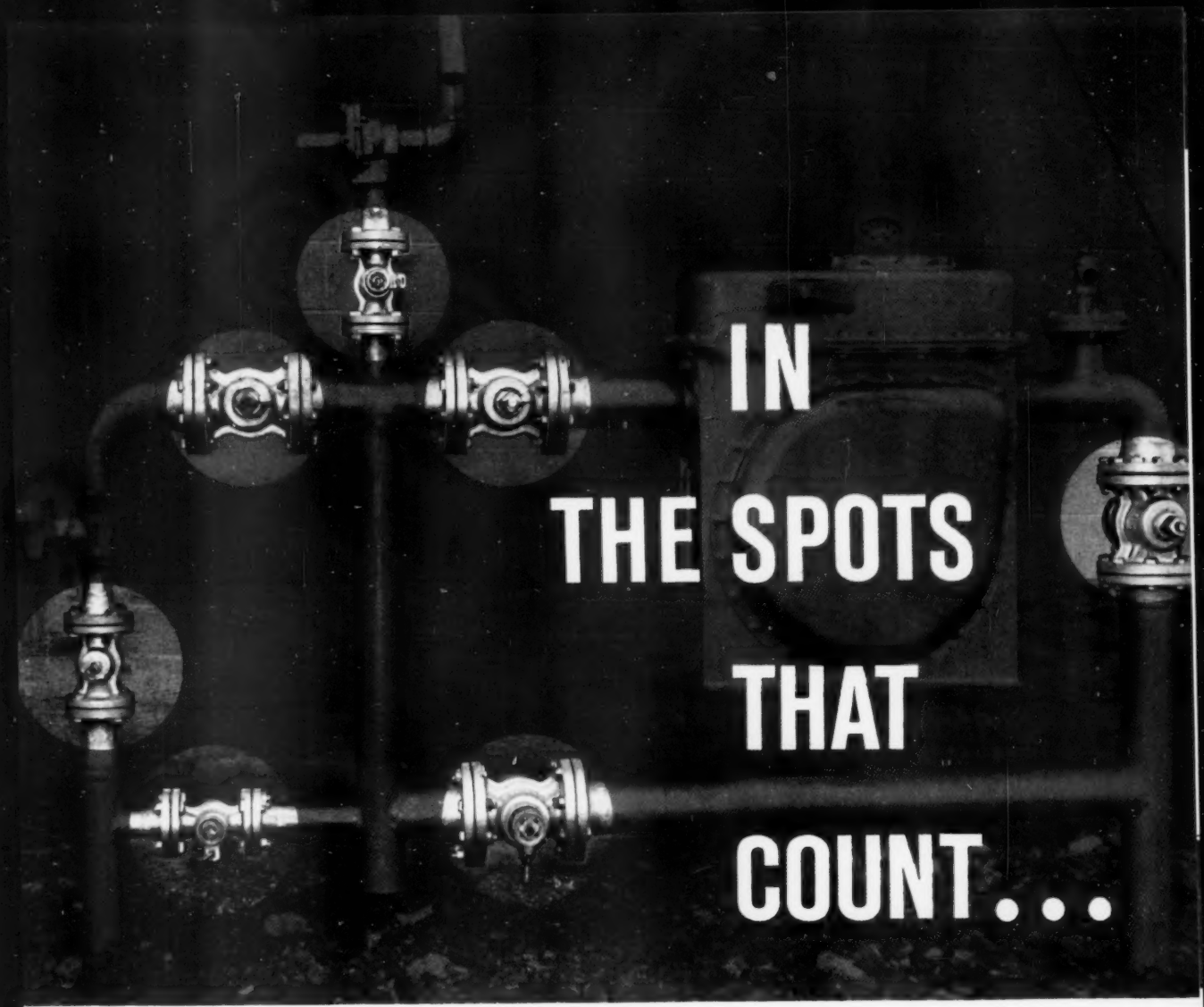
Reports provided by the companies will be coded, recorded on punched tabulated cards, and analyzed to find trends and common service problems.

Seven major objectives of the program:

1. To aid manufacturers in eliminating troublesome appliance design and performance features.

2. To assure that appliances on the market comply with American Standard approval requirements, as sponsored by the AGA.

3. To assist the association's research and development committees by identifying appliance features

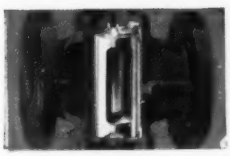


Gas Distribution Company uses over 2500 Homestead Valves for leak-proof gas control

Clogged orifices, fouled meters, damaged rubber diaphragm regulators are things of the past for this southwestern gas distribution company since they installed Homestead Lubricated Plug Valves on their gas lines to meters.

Controlled pressurized lubrication plus exacting tolerances between valve plug and body prevent lubricant from being forced into the line; insure trouble-free, leak-proof gas control.

Homestead's cylindrical plug, plus its piston-like movement during each lubrication, assure stick-free operation. Homestead Valves are virtually fool-proof... require no adjusting in the field.



For further information concerning low first cost, low maintenance Homestead Valves, send coupon today for catalog 39-1.

hv

HOMESTEAD VALVE MANUFACTURING COMPANY
P.O. Box 405, Coraopolis, Pennsylvania

Please send me additional information concerning Homestead Lubricated Plug Valves.

Name..... Title.....

Company.....

Address.....

City..... Zone..... State.....

in need of improvement.

4. To supply performance data to AGA's approval requirements committee for possible requirements revision.

5. To provide utility service departments with information on unusual appliance service problems.

6. To present service-cause analyses indicating the desirability of any types of controls or devices in future models.

7. To assemble data on types and makes of gas equipment not currently covered by American Standards.

Tiny electronic device 'meters' heating comfort

Introduced to the press recently was a super-sensitive home heating control system that provides instantaneous and continuous modulation of a gas furnace flame completely by electronics.

The system, made by Maxitrol Co. of Detroit, is so sensitive that it reacts to the warmth of a baby's hand. It permits continuous circulation of warm air from the furnace, eliminating intermittent blasts that result in cold floors and warm ceilings.

A thermistor, the size and shape of an automobile fuse, provides the system's sensitivity. The tiny electronic unit is able to detect the slightest change in room temperature and, through a transistorized circuit, signal an electronically operated power head to modulate the furnace flame. The burner is controlled precisely and instantaneously in accordance with comfort requirements.

Canada's Consumers' Gas offers new stock issue

Consumers' Gas Co., Toronto, has a new issue of $10 million of 5½ per cent preferred stock, continuing the financing of its program to bring natural gas service to more Ontario communities.

This new issue brings to $76 million the total of financing done by Consumers' since 1954 when the company launched its plan to bring U. S. gas to the Toronto area to build a market for natural gas before the arrival of Alberta gas via the Trans-Canada line.

In the four years since natural gas first arrived, Consumers' has made the fuel available to more than 100 communities.

West German company exporting line pipe

Phoenix-Rheinrohr A.G., one of Europe's largest steel and pipe makers, is producing pipe built to API 5L and 5LX standards.

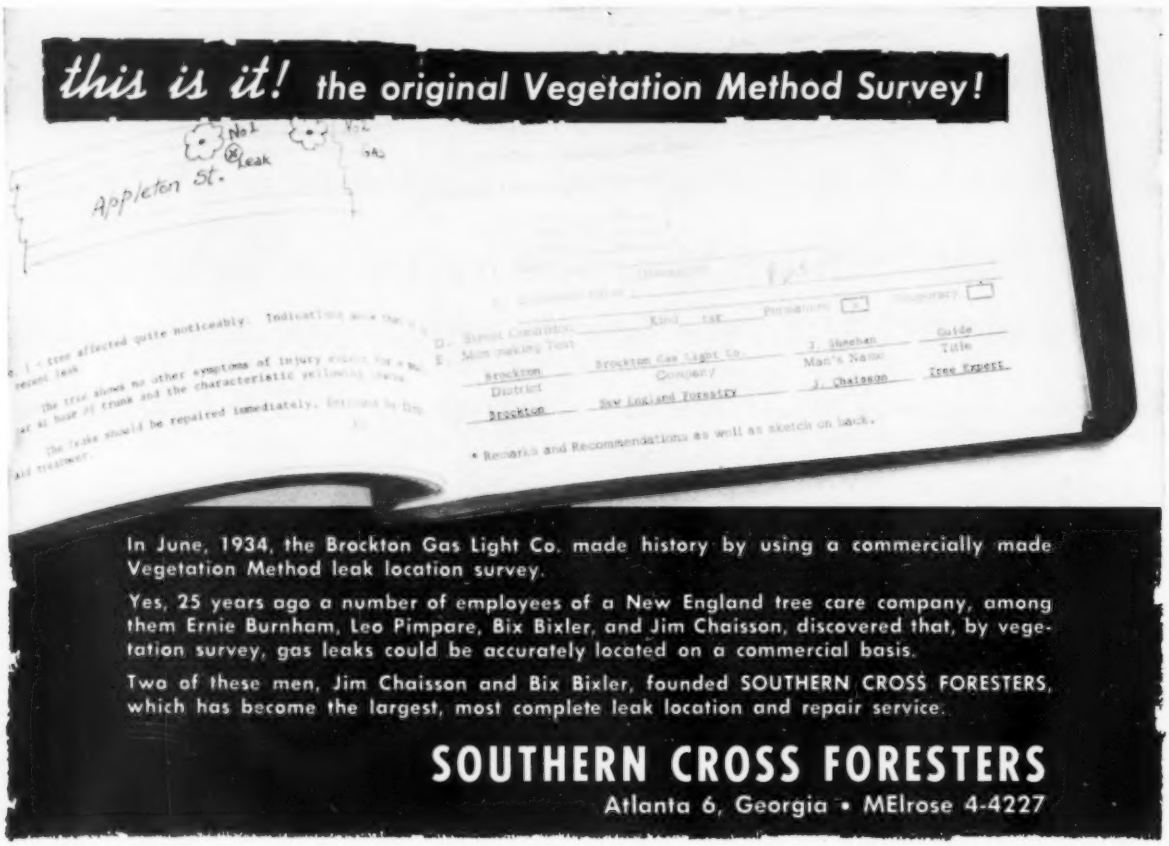
Phoenix - Rheinrohr makes its pipe in all sizes up to 36 in. OD, seamless and with welded seams.

The Duesseldorf, West Germany company, ships its products to all parts of the globe from its seven plants located on the Rhine and Ruhr rivers.

PG&E proposes underground storage

Pacific Gas & Electric Co. has asked the California PUC to approve its plan to store gas underground in the partially depleted Pleasant Creek gas field near Winters, Calif.

When fully developed at an estimated cost of $2.5 million, the field



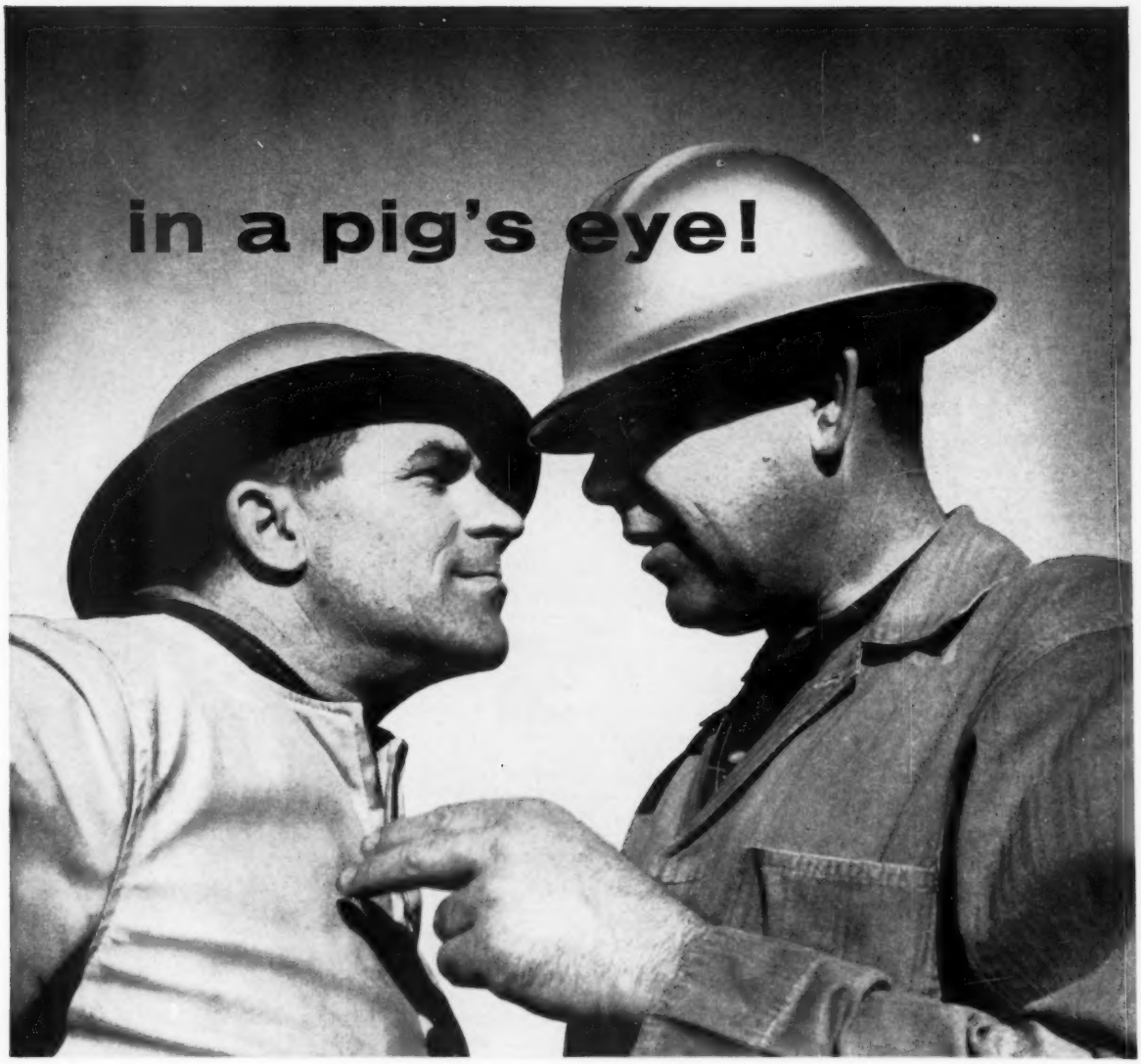
In June, 1934, the Brockton Gas Light Co. made history by using a commercially made Vegetation Method leak location survey.

Yes, 25 years ago a number of employees of a New England tree care company, among them Ernie Burnham, Leo Pimpare, Bix Bixler, and Jim Chaisson, discovered that, by vegetation survey, gas leaks could be accurately located on a commercial basis.

Two of these men, Jim Chaisson and Bix Bixler, founded SOUTHERN CROSS FORESTERS, which has become the largest, most complete leak location and repair service.

SOUTHERN CROSS FORESTERS

Atlanta 6, Georgia • MElrose 4-4227



THERE IS A DIFFERENCE IN VENTURI VALVES

The difference is Grove's compact body design. It permits a long, gradual taper of venturi valve hubs that gives you better flow characteristics than any other reduced opening valve. Ordinary valves have thicker bodies and a sharper taper of venturi hubs, causing increased line turbulence and resulting pressure loss.

Even with a port reduction of two to four basic pipe sizes, Grove Seal-O-Ring Venturi Valves have comparable flow capacity and pressure loss to so-called "full ported" rectangular port plug valves. And, they cost less too.

Before you buy any other valve, ask your local Grove man to give you the complete story on these fine valves.

GROVE VALVE and REGULATOR COMPANY

65th & Hollis Street, OAKLAND 8, California

HOUSTON 27—3203 Mercer St. • LOS ANGELES 6—2559 W. Olympic Blvd.
ODESSA • TULSA • DENVER • CHICAGO • NEW YORK • DALLAS • PITTSBURGH
FARMINGTON, N. M. • LAFAYETTE, LA. • HARVEY, LA. • LONGVIEW, TEXAS
In Western Canada: GROVE VALVE LTD., EDMONTON

5384

Lower Battery Drain—No need now for heavy duty batteries and generators. Current drain on "stand-by" is 1/3 that of tube-type receivers, 1/15 with battery saver switch.

Greater Reliability—Transistors, printed circuits and new design all greatly increase reliability.

Smaller, Lighter—Approximately 1/2 the weight, 1/3 the size of other models. Mounting in tight quarters easier than ever.

Completely transistorized receiver and power supply... Another Motorola First!

Here is 2-way radio with efficiency and reliability never before approached in mobile radio. No more tubes in the receiver —no more vibrators in the power supply . . . all are replaced by long life, dependable transistors. No longer is it necessary to idle the vehicle to keep the radio operating. Savings in gasoline, engine wear and batteries add up fast. Let us prove to you how MOTRAC radio will cut your radio operating costs . . . while giving you reliability never before possible. Write today.

MOTOROLA 2-WAY RADIO

Motorola Communications & Electronics, Inc. • A Subsidiary of Motorola Inc., 4501 Augusta Blvd., Chicago 51, Ill.

MOTRAC is a trademark of Motorola Inc.

would provide usable storage for 3.25 billion cu ft. The area would have a maximum withdrawal rate of 80 MMcf per day and a sustainable withdrawal rate, so long as there is gas in storage, of 40 MMcf per day.

Iroquois moving to new office

Iroquois Gas Corp. is moving from the building it erected in 1912 and has occupied ever since.

The Buffalo-based company has signed a 20-year lease to take over part of the ground floor and all of six other floors in the new Tishman building. The move will be made this summer and fall.

Universal flame-detecting unit introduced

A universal flame detection device that can be used on all types of commercial and industrial heating or processing burners has been introduced by Minneapolis-Honeywell Regulator Co.

Heart of the system — termed "the most significant advance in flame detection in the last decade" — is the company's recently unveiled ultraviolet-sensitive tube. Honeywell's market manager Lloyd L. Hamilton said the tube makes possible the practical use of invisible ultraviolet rays in flame-detection applications.

Quebec electric board to oversee gas operations

The Quebec government has introduced a bill giving the provincial electricity board extra powers to ensure public safety and prevent accidents in the distribution and use of manufactured and natural gas in the province.

The board would have the power to regulate construction, repair, maintenance, replacement and inspection of any conveyance system, distribution network, pipe, apparatus and piping for the conveyance, distribution and consumption of gas.

Canada's Union Gas Co. realigns, expands

Union Gas Co. of Canada Ltd., Chatham, Ont., has divided its operating area — extending from Windsor to Dunnville and from Lake Erie to Goderich—into seven

There are more DAVEY "Auto-Airs" in service today than the combined total of all competitive makes!

Here are a few of the many reasons for this overwhelming preference

The Davey Hydrovane Rotary "Auto-Air", driven direct from the truck engine through a Davey heavy-duty power take-off, is the world's most portable compressor. It moves from job-to-job as fast as the truck will travel.

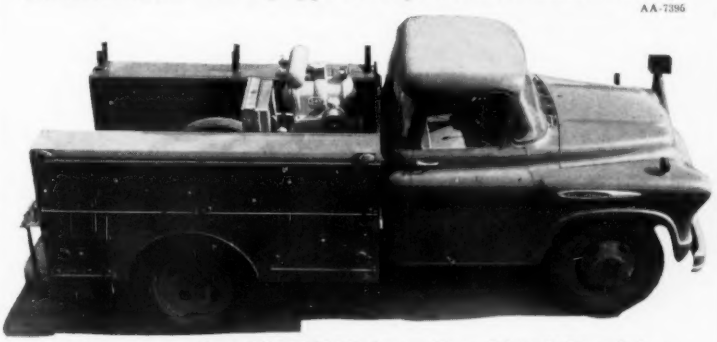
Price of complete compressor-truck unit compares favorably with trailers of same capacity.

"Auto-Air" occupies only one-third of truck body space. Rest is available for transportation of men, tools, materials.

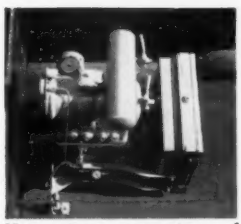
Davey is the only manufacturer that builds the complete "Auto-Air" . . . covers compressor and take-off with one guarantee.

Standard "Auto-Airs" are available in 125 and 160 c.f.m. capacities . . . other sizes on special order. They can be mounted on most standard trucks with any type of body. Write for Bulletin E-230.

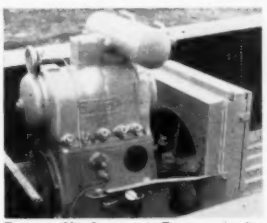
AA-7396



Typical Model 125 Hydrovane Rotary "Auto-Air" installation.



Note extreme compactness of Hydrovane Rotary Compressor.

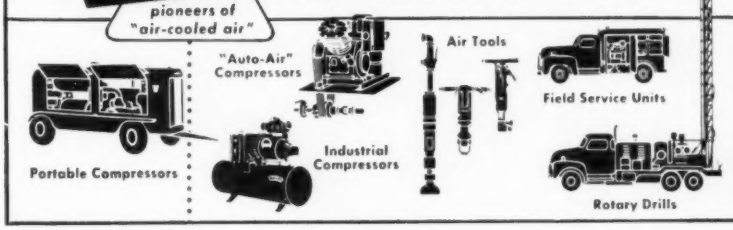


Davey Hydrovane Rotary units have 50% fewer working parts than ordinary compressors . . . are easy and economical to operate, maintain, service.

DAVEY

pioneers of "air-cooled air"

DAVEY COMPRESSOR CO. • KENT, OHIO



with the new

Lancaster

LEATHER DIAPHRAGM

PROCESS *and*

oiling methods

Low differentials . . . high accuracy . . . the smoothest, wrinkle-free diaphragm performance you've ever seen! Exclusive **Lancaster Leather Diaphragm** processing assures that the same amount of gas is displaced and measured with every stroke.

The **Lancaster Leather Diaphragms** you order now make possible the most accurate gas measurement ever from Sprague 1-A meters. Larger size leather diaphragms for Sprague meters are also being produced by the same new Lancaster process.

"a meter is only as accurate as its parts"

Lancaster **METER PARTS CO.**

Manufacturers of Quality Parts for Gas Meters

POST OFFICE BOX 378 LANCASTER, OHIO

Canadian Representative: Ontar Limited, Toronto 2, Canada

CLIP THIS AND MAIL TODAY

if you have not subscribed to . . . GAS

GAS 198 SOUTH ALVARADO STREET, LOS ANGELES 57, CALIFORNIA

Standard Rates Apply to U. S. & Possessions

☐ Check herewith ☐ Bill me ☐ 2 years $3.00 ☐ 1 year $2.00

Name _____ Title _____

Firm _____

Street _____

City _____ Zone _____ State _____

districts. The move involves establishment of two new districts and the relocation of the boundaries of some existing districts.

Three things brought about the move: expansion of the Union Gas system into new areas; acquisition of the major portion of Dominion Natural Gas properties in southwestern Ontario; and the transfer of distribution franchises by City Gas Co. of London to Union Gas.

The two new districts are Simcoe and Brantford. The realigned districts are: Windsor, Chatham, Sarnia, London, and Northern.

Acquisition of Dominion Natural's two gas production areas in Norfolk and Haldimand counties resulted in enlargement and reorganization of Union's production department into three divisions: Port Alma, Dawn, and Eastern. The latter includes: Simcoe, Dunnville, and Selkirk.

Freedoms Foundation award to K-N Gas

Kansas-Nebraska Natural Gas Co., Hastings, Neb., was awarded the George Washington Honor Medal Award by the Freedoms Foundation of Valley Forge for "an outstanding achievement in helping to bring about a better understanding of the American way of life during 1958."

Nomination for the award was made on the basis of a series of institutional ads which Kansas-Nebraska placed in daily and weekly newspapers in its operating area in parts of Nebraska, Kansas, and Colorado. The ads carried the theme "What Makes America Great?" and pointed out various fundamental beliefs in and achievements of the American economic system and way of life.

FPC calls 1958 "period of trial"

During FPC's 1958 fiscal year, 337 certificates were issued for construction of pipeline projects costing nearly $519 million, according to the commission's annual report.

Describing the year as "still a period of trial," the report said the number of filings by independent producers "soared to fantastic totals . . ." During the year, the commission received 1416 certificate applications and 7665 rate filings from independents in addition to the normal load of filings from gas pipelines.

The FPC's backlog of rate cases continued to climb with 53 cases involving some $211.5 million annually still pending at year's end. This compared with 41 cases amounting to $178 million a year earlier.

GAS • News Notes

Consumers' Gas Co., Toronto, has completed the purchase of the Peterborough (Ontario) propane gas system. Last November, Peterborough citizens voted to sell the municipally owned gas system to Consumers.

White-Rodgers Co., St. Louis, has opened two new West Coast sales and service branches. Located in Los Angeles and Portland, the new offices assume duties formerly handled by Pacific Scientific Co. as manufacturer's representative.

HydroTech Industries is the new name of Texas Lawn Sprinkler Co. Inc., Dallas. Two sales divisions have been set up, with John Wilkinson as vice president of sales for the Telsco Fittings Division and A. C. Sarsfield as vice president of sales for the Weather-matic Sprinkler Division.

Negotiations have been completed for the acquisition of Chippewa Plastics Inc., Chippewa Falls, Wis., by the Rexall Drug Co. Chippewa will operate as an independent division under present personnel with headquarters continuing in Chippewa Falls.

R. S. Stover Co., Marshalltown, Iowa, sales representative of Fisher Governor Co., has opened a district office in Omaha. Headed by Virgil Jansen, the new office serves Nebraska and western Iowa.

Under terms of a recent agreement, Moffats Ltd. will manufacture and market Norge appliances in Canada. Among products to be produced are combination washer-dryers.

Cartier Gas Corp., subsidiary of Consumers' Gas Co. of Toronto and St. Maurice Gas, has signed up its third community in Quebec for natural gas service. Waterloo joined the other Eastern Townships of Magog and Granby.

We're Still Looking for a Pipe Fitter Who Doesn't Prefer RIDGID
RIDGID HEAVY DUTY 14
"Of Course I said RIDGID
...It's the only pipe wrench for my money. I've got work to do!"
At your Supply House
The Ridge Tool Company
Elyria, Ohio, U.S.A.
THREADED PIPE...It's Tight...It's Best...Costs Less!

REYNOLDS

NRT-8010 SERIES

New House Service Regulator

NEW ALUMINUM BODY AND TOP
CAST IRON INLET UNIT
V-TYPE STAINLESS STEEL BAND

ONLY ONE STAINLESS SCREW with nut to remove for complete orifice and valve pocket. Permits exchange of diaphragm case without removing inlet unit from line.

Supplied as:

1. No seal type
2. No seal type with automatic cutoff
3. Internal diaphragm operated relief valve for complete over pressure protection
4. Internal diaphragm relief and automatic cutoff

REYNOLDS
REGULATOR CO.
ANDERSON, INDIANA

1897 **1959**

PIPE STOPPERS OF ALL KINDS

SAFETY GAS MAIN
STOPPER CO. INC.

GOODMAN — USED SINCE 1897 — 2 HANDLE & LOCKING SLEEVE — GAS MAIN STOPPER

523 Atlantic Avenue
Brooklyn 17, N. Y.
Cable Address GASTOPPER, N. Y.

Increased use of gas in December 1958 brought the year's total sales to 79,582 million therms, AGA reports. This represents a 2.9 per cent gain over 1957's total of 77,333 million. Natural gas sales during the year amounted to 77,167 million therms, compared to 75,013 million in 1957.

Brooklyn (N. Y.) Union Gas Co. has specified that all 6-in. lubricated plug valves for use in its distribution system be of ductile iron. According to Walworth Co., this is the first use of the new metal in BU's operation.

Walworth Co., New York, has named its subsidiary, Grove Valve & Regulator Co., Oakland, Calif., as sales agent for specialized lubricated plug valve products to certain companies.

A. O. Smith Corp.'s Permaglas Division has completed its $5 million-plus expansion and modernization program of production facilities in Kankakee, Ill. Included in the program were acquisitions of a water softener plant in Omaha and a water heater production plant.

Sunray Mid-Continent Oil Co. has started construction on a million-dollar gas products plant in McClain county, Okla. The new facilities will process 5 MMcf of gas a day and produce 32,000 gal. a day of propane, butane and natural gasoline.

Washington • *Cont'd.*

from page 17

tractive even to congressmen who are not opposed to the present rate as such.

Between the money raisers and the politicians who figure they can pick up some votes in an election year by attacking the gas industry —and the few who probably honestly believe the 27½ per cent may be too high—the depletion rate is going to be in for a real working over.

Because the outlook for depletion is worse next year, the outlook for passage of a natural gas bill is a little better.

If the gas industry opponents are successful in shaving the depletion rate, the gas producer's arguments that freedom from federal utility-type controls is neces-

sary will carry a little more weight. Whether it will be enough to give the bill the velocity needed to put it through is still doubtful.

Meanwhile, federal controls are pinching the industry tighter and tighter.

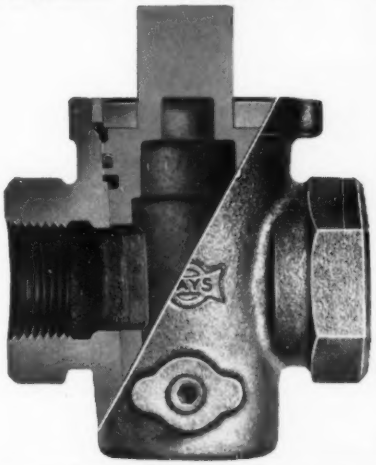
Pipelines felt the bite again recently when a Federal Power Commission examiner ruled that a pipeline is entitled to recover only the "actual cost" of gas it produces plus a return of 5.75 per cent on its overall cost of service. Profits from stripping liquids from gas produced must be used to offset production costs and lower prices to the consumer, the examiner ruled.

If the entire commission upholds the examiner's ruling (in the Panhandle case), the next step could easily be to add gas producers' profits from oil into computations of gas prices to arrive at rates of return. This, the producers claim, would be a real disaster, would further curtail discoveries, and in the long run further cut gas supplies. It would eventually bring higher prices for gas, they claim. (The Harris bill would attempt to prevent this sort of approach by the commission.)

In addition, the commission soon will decide whether a pipeline company may keep the savings it receives from tax depletion and intangible drilling costs for working funds or whether they must be passed on to the consumer in the form of lower rates. An FPC examiner (in the United Fuel Gas case) has ruled that they must be passed on. The full commission was due to open oral arguments on the ruling in mid-March. Gas industry lawyers expect the commission to reverse the examiner on this ruling. They base their expectations (or hopes) on past commission rulings which have upheld the use of depletion savings for increasing reserves.

In yet another area, the FPC is attempting to slow the trend toward wellhead purchases of gas by gas distributing companies. And it is also indicating it will not permit interstate movement of large quantities of gas primarily for boiler-fuel uses (See Pipeline News).

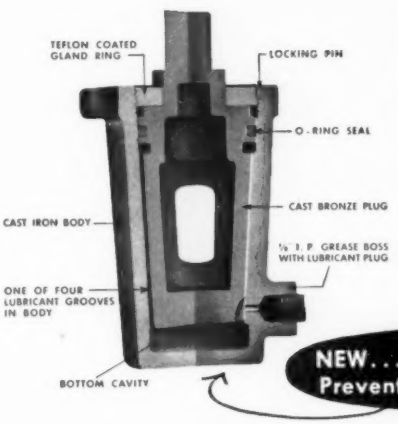
THIS GAS STOP WILL NOT STICK...



- A newly designed HAYS Lubricated and Tamper-Proof Gas Stop . . .
- Stop is completely lubricated at the factory . . .
- Four Grooves in body, and Lubricant Plug provide for pressure re-lubrication . . .
- Locking Pin positively prevents tampering at top of stop . . .
- O-Ring prevents top leakage . . .
- Teflon Coated Gland Ring reduces friction between top of plug and gland ring...

Re-Lubrication does the TRICK

HAYS LUBRICATED TAMPER-PROOF SAFETY GAS STOP*



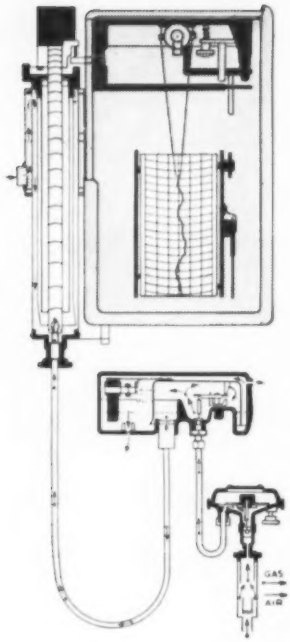
- Lower initial and turning torque . . .
- Extra grade gray iron body, gas service bronze plug . . .
- Individually tested . . .
- Black or Galvanized, Flat Head or Lockwing Pattern...
- Sizes: ¾", 1", 1¼", 1½", 2", for 125 psi. W. P.

Write for Folder 121 and prices.

*Patent applied for.

NEW... Solid Bottom Construction Prevents Leakage and Tampering

HAYS®
GAS SERVICE PRODUCTS
HAYS MANUFACTURING CO.
ERIE, PA.



Sigma
Wobbe Index Recorder
THE WORLD'S FIRST

Now, Sigma's Wobbe Index Recorder gives you a continuous record of *actual* thermal delivery.

$$\text{Wobbe Index} = \frac{\text{Calorific Value}}{\sqrt{\text{Specific Gravity}}}$$

This instrument is reliable and relatively inexpensive. Recordings are highly accurate. An optional unit will also control Wobbe Index if desired.

The Flow Regulator regulates gas flow to the burner. It senses slight changes in specific gravity and compensates for changes in barometric pressure and room temperature.

The Recording Mechanism is actuated by the heat of the combustion of the gas. Responds rapidly to changes in Wobbe Index. Not affected by normal temperature and pressure changes. Highly sensitive, frictionless magnifying system. All parts well protected against corrosion.

Write For Further Information

COSA — *National Representatives for Sigma Instrument Co., England*

COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N. Y.

RUGGED and READY
Adams No. 220

Here is robust simplicity with the finest material used in each individual part: Malleable Iron lug castings ruggedly designed, 18-8 Stainless Steel band for corrosion resistance and high tensile strength, Soft Neoprene gasket for positive seal, Large Cadmium Plated steel bolt with chromate post-plate treatment. ***Quick, permanent repair.*** Simply snap on pipe, drop bolt through open-slot and tighten.

Since 1933 **Adams PIPE REPAIR PRODUCTS**

2453 MERCED AVE., SO. EL MONTE, CALIF. · 336 POPLAR ST., COLUMBIA, PENNA.

The commission, in a split decision, turned down Transcontinental Gas Pipe Line Corp. in a bid to transport gas purchased at the wellhead by Consolidated Edison Co. of New York.

In one quick stroke, the FPC indicated that the project was not acceptable for two reasons, both of which should give the gas industry pause:

1. The project would take for industrial use pipeline facilities which "otherwise would be available to meet more urgent and widely beneficial public needs." The gas to be transported for Consolidated was to be used under boilers in a New York City steam-electric plant.

2. Field purchases of gas by distributors, because they are not subject to federal price controls, are threatening to boost the price of a "relatively limited supply" of gas.

The commission did not completely reverse past policies under which gas for boiler fuel has been approved. It based its rejection partly on a lack of firm commitments from industrial customers, but added that justification for the project "was further weakened by the proposed end use of the gas."

SOME distributors and pipelines may be facing higher taxes as a result of a recent U. S. Supreme Court decision. So will many manufacturers of industrial as well as consumer products.

Prospect of higher levies stems from a high court ruling that each state may impose an income tax on the portion of profits of an out-of-state corporation earned within is boundries.

Many gas industry firms already pay taxes on portions of their incomes to more than one state. But only 35 states have corporate tax levies, and not all of these have attempted to tax profits from sales within their boundries of corporations based in other states.

The high court in effect invited these states to enact new laws when Justice Frankfurter noted the decision "will stimulate, if indeed it does not compel, every state of the union, which has not already done so, to devise a formula of apportionment to tax the in-

come of enterprises" conducting business in more than one state.

Not only do business firms of all types face new state taxes on out-of-state operations, but they also will be faced for some time to come with double taxation of some of their profits. This is an almost inevitable result of the court's ruling.

"Logically, it is impossible, when the tax is fairly apportioned, to have the same income taxed twice," Justice Clark noted. But he added that "in practical operation, apportionment formulas being what they are, the possibility of the contrary is not foreclosed, especially by levies in domiciliary (home base) states." But the Court said that this issue was not before it for solution.

Some states have systems for attempting to apportion income of out-of-state corporations. They range from the complex to the simple and even ridiculous. Some use a three-criteria method of averaging the percentage of sales, payroll and property holdings in the state in relation to a firm's entire sales, payroll, and property, and tax an equal portion of total profits.

Others tax any activity within their borders that is "for the purpose of financial profit or gain," including Georgia which was one of the two states which was upheld by the Supreme Court.

In its decision, the court said that states may tax the net income of out-of-state corporations on almost any basis they choose "provided the levy is not discriminatory and is properly apportioned to local activities within the taxing state."

The court based its ruling on the principle that the laws are not intended to "immunize commerce from carrying its fair share of the costs of the state government in return for the benefits it derives from within the state."

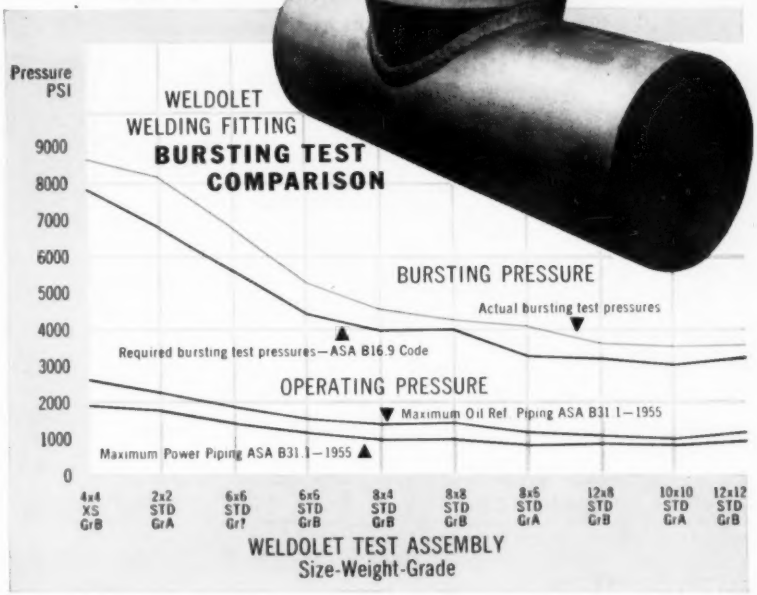
Earlier Supreme Court rulings have prevented states from taxing persons crossing their borders for "temporary" purposes; for the privilege of conducting business in interstate commerce; from discriminatorily taxing of interstate firms to help local business, or from deliberately subjecting interstate firms to double taxation.

In the long run, as corporations

BONNEY FORGE

WELDOLETS®

CONSISTENTLY TESTED TO...



...OVER

4½ TIMES MAX. OPERATING PRESSURE

"Shape of Reinforcement"—has been pioneered by Bonney for the past 20 years. The fact that shape is as important and even more important than area replacement for branch reinforcement is now gaining wide industry recognition. Even though Weldolets *do* have sufficient area replacement, the factor setting them apart from conventional lap type reinforcement is their SHAPE . . . Reinforcement close to the juncture—completely bonded homogeneous reinforcement avoiding cracks, fillet welds, and re-entrant corners—reinforcement tapering at the sides to prevent abrupt change in thickness where fitting joins header pipe.

Recent design improvements in the Weldolet line, based on extensive stress analysis tests, provide all these desirable "shape" factors. Specify and use Weldolets for all your full size and reducing branch connections. They are available in carbon steel and all alloys for any piping service.

BONNEY

WELDOLETS®
THREDOLETS®
SOCKOLETS®
ELBOLETS®
BRAZOLETS®
SWEEPOLETS®

CARBON STEEL
STAINLESS
ALLOY
for all services

BONNEY FORGE and TOOL WORKS
ALLENTOWN, PENNSYLVANIA

Which Size For YOU?

Rugged, Inexpensive Vermeer
POW-R-DITCHERS

Looking for low-cost, time-saving trenching and ditching? Take a look at the full Pow-R-Ditcher line before you buy!

Write For Complete Information, Literature and Low Prices

The model 4T (left above) digs 6" to 14" wide and the W-2 (right above) digs 2½" to 4" wide. (The larger 524T model digs up to 24" wide.) All are fast, rugged, self-propelled and low in price. Ideal for digging foundation footings, gas, water and sewage lines . . . or for shallow, narrow service lines.

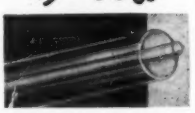
VERMEER MANUFACTURING COMPANY
1441 W. WASHINGTON **PELLA, IOWA**

Length after length . . .
Mile after mile . . .
Every inch of

BUSADA BUTYRATE (PLASTICS) GAS PIPING IS IDENTICAL!

IT'S CLEAR! YOU CAN SEE IT'S BY Busada

It is transparent . . . made from one specific material formulation containing the same physical properties shipment upon shipment. Its high quality is constant. Made to same O.D. as steel pipe with 2 wall thicknesses. Close tolerances insure leakproof, trouble-proof ease of installation. Complete line of fittings.



Butyrate pipe now available in black

Made by Busada Mfg. Corp., for
BUSADA SUPPLY CO. INC. **32-21 DOWNING STREET FLUSHING 54, NEW YORK**
Representatives in: Boston, Los Angeles, Shreveport, La., Kingsport, Tenn., Grand Rapids, Mich.

appeal state levies or taxing formulas to the courts, some standardized apportionment formula will probably evolve. Accountants and business firms have been trying for years to get the states to adopt some type of standard approach, but without success.

Multiple taxation of profits could arise from situations existing, for example, between the neighboring states of New York and Pennsylvania. New York considers anything shipped out of or into the state as sold within its boundries. Pennsylvania considers anything ordered through an office within its boundries as a sale, even though the goods never enter the state. Thus the same sale could produce income taxable in both jurisdictions.

The high court also upheld the right of a state to collect a property tax on raw materials brought into the state and stored for immediate use within the state.

In some cases, this ruling may lead to new tax levies by the states on gas storage, on stockpiles of line pipe or other equipment, and on manufacturing plants with inventories of steel, plastics, or other raw materials.

Neither of these two decisions are likely to be reversed by Congress. In both cases, the issues involved the rights of a state under the Constitution. Congress can change the Constitution only by an amendment which the states must ratify—an unlikely prospect in view of many states' desperate need for more tax revenues.

IT'LL be what you show and not who you know when dealing with the Federal Power Commission and other government regulatory agencies in the future. It will, at least, if Rep. Oren Harris has his way.

The Arkansas Democrat is cranking up his House Commerce Investigating subcommittee probe of the conduct of members of these commissions and persons who appear before them. Last year, this free-swinging body caused the resignation under fire of a member of the Federal Communications Commission, and led directly to the resignation of Sherman Adams as top assistant to President Eisenhower.

Before the year ends, Rep. Harris wants to have the lawmakers convinced something should be done. He's got a few ideas, embodied in legislation he introduced recently. It's designed to make certain that exhibits replace pressure in cases these commissions handle.

This measure would provide for criminal penalties of up to a year in prison and a $10,000 fine for each violation of provisions prohibiting attempts at "back-door" influencing of commission members.

It would require the commissions —there are six, including the FPC —to set their own codes of ethics for members and make regulations governing conduct of members and supplicants. A commission could reprimand or discipline its own personnel and disqualify applicants, attorneys or others who get out of line.

The Harris clean-up bill would also give the President clearer and broader power to remove commissioners for neglect of duty or malfeasance in office. But it would take away the President's power to name the chairman of these commissions. Instead, each agency would elect its own chairman, and he would be limited to three years out of every six years.

It would also require that all letters, telegrams, or other written communications on any pending case be placed in the public record, and would prohibit so-called ex parte contacts or secret communications between agency officials and persons interested in pending cases.

The Federal Power Commission last year escaped with only a "suggestion" from Harris that it draft its own clean-up rules or legislation if it's needed. This came in spite of hints before the hearing that subcommittee probers had uncovered some "interesting" information.

Specifically under study by the group was FPC's policies in issuing "temporary" certificates to pipelines which didn't appear to be very temporary. Under pressure from the Harris subcommittee, FPC officials admitted that these policies perhaps needed some review, and agreed to do it themselves.

As yet, there has been no report from the FPC on its study. ■

SOONER BOOMERS "team up" for laying large diameter lines!

Construction crew at Laclede Gas Company, St. Louis, is shown lowering in a section of coated and wrapped steel main in the Kirkwood area of St. Louis. Note two Sooner Boomer units are being used, assisted by a crane. For over 2 years, Laclede Gas has made good use of their Sooner Boomer units, keeping them busy throughout the year.

Rubber-tire mounted SOONER BOOMER does work of 2 conventional machines!

The only proven side boom on rubber tires, the Sooner Boomer —designed to handle 10" pipe— eliminates unnecessary right-of-way damage on city work as shown above. It also eliminates the need of pipe stringing along city streets ahead of ditch. A low center of gravity makes the Sooner Boomer highly stable, loaded or unloaded. Highly maneuverable, it operates at road speeds up to 27 MPH. The 12-ft. boom makes it possible to lower in over spoil. Other features include all-hydraulic operation; hydraulic controlled counter weights; power steering; perfect operator visibility; lowest initial cost and lowest operating cost! Call, wire or write for complete details now!

SOONER BOOMER MFG. DIV.
Oklahoma City Oklahoma

PHONE TR 8-2127

P.O. BOX 8686

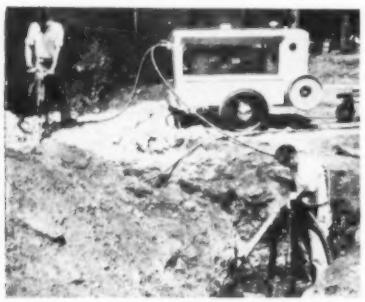
GAS DIGEST

New Products and Trade Literature

For more data on any of these items use the Readers' Service Card on pages 97, 98

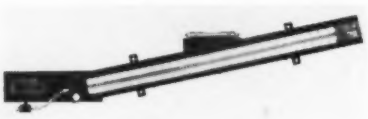
1. Gas hound

The "Gas Hound" has been designed to speed the job of probing for gas main leaks. It is claimed that one man with the new self-propelled prober can power check 28 blocks of mains and services in 8 hr. Pushbutton controls let operator complete leak test in 15 seconds. Short turning radius and reverse gear make it easy to test close to curbs and buildings.
Detecto Co.



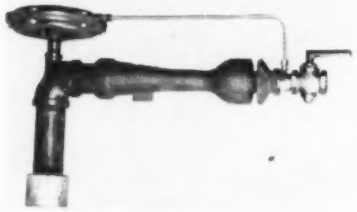
2. Rotary air compressors

Davey Compressor's new line of portable rotary air compressors features the newly developed Perma-Vane rotor blades. Of special solid, lightweight material, Perma-Vane blades are said to have greater wear resistance, prevent serious compressor damage, and assure longer, more efficient life. Their light weight and minimum friction reduce horsepower required.
Davey Compressor Co.



3. Manometer

King Engineering's line of inclined-tube manometers measures pressure, vacuum, differential pressure or flow. The indicating tube is inclined rather than vertical so that for any given pressure change the liquid in the tube moves a distance several times as great as the change in height.
King Engineering Corp.

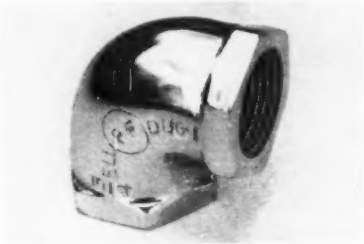


4. Venturi torch burners

Bryant's Hi-Lo burner provides industrial or process heating equipment with an extremely wide range of heat control. With low-pressure gas, the burner offers 10 to 1 turndown without flashback or loss of flame stability. With 10-psi gas, the burner provides 16 to 1 turndown. The flame is adjusted automatically when the single control valve changes the gas input.
Bryant Industrial Products

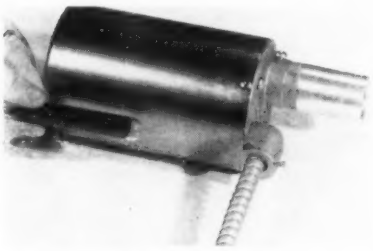
5. Piping strainers

Designed specifically for gas pipelines is a new line of piping strainers from Air-Maze Corp. Efficient elimination of objectionable dirt particles and other foreign matter is accomplished by a special media design incorporating a cylindrical multi-step construction. With this type of construction, a maximum filter area is made available for maintaining the initial low resistance through the media.
Air-Maze Corp.



6. Threaded pipe fittings

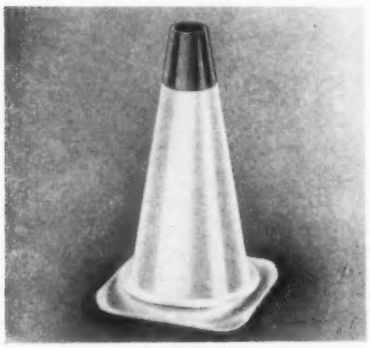
Dryseal threaded NPTF pipe fittings are made of malleable ductile normalized air furnace iron. Included in the line are tees, 45- and 90-deg. elbows, reducing couplings and tees, pipe caps, hex bushings, unions and nipples. Dryseal fittings are completely interchangeable.
Pipe Fittings Inc.



7. Flame detecting unit

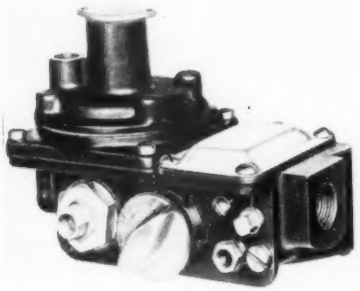
Honeywell has introduced what it describes as the first universal detection device for use on all types of commercial and industrial heat-

ing or processing burners. Heart of the system is the company's recently unveiled ultraviolet-sensitive tube. Practical applications include exothermic gas generators, radiant cup burners, and flame hardening machines.
Minneapolis-Honeywell



8. Traffic cones

A complete line of plastic Traffi-cones, adapters and accessories has been developed by Interstate Rubber. Three new plastic cones are available in all three standard sizes —12, 18, and 28 in. They are heavily constructed and properly engineered to resist greater wind velocities. No painting or maintenance is required.
Interstate Rubber Products

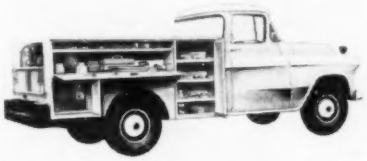


9. Control center

A small, compact gas control center that does the work of six gas controls is available for use in wall heaters, clothes dryers, space and unit heaters. The unit, Series 5010, provides all the conveniences of automatic thermostatic control at any temperature.
Controls Co. of America

10. Hydraulic tilt cylinders

Tractor operators whose work includes pioneer land clearing, removing stumps, dozing on slopes, digging rocks or ditching can do an effective job by use of hydraulic tilt cylinders on their bulldozers. According to Caterpillar, when the cylinder is mounted on a dozer, it is possible to put tremendous prying action on the corner of the blade from an in-the-seat position.
Caterpillar Co.



11. Utility truck bodies

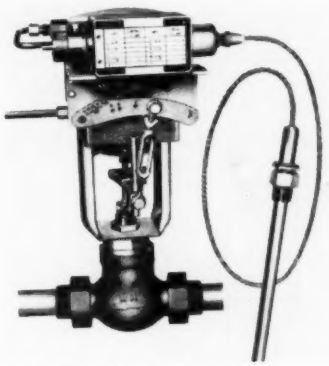
"File box" convenience is featured in a new series of job-planned utility truck bodies. Reading Body Works' new bodies offer convenience in organizing storage tools, materials, supplies and equipment. Removable shelf and tray dividers, similar to those in file drawers, and removable shelves now permit individual truck operators to vary the vehicle's interior compartment arrangements to suit daily requirements.
Reading Body Works Inc.

12. Embossed labels

Embossed labels can be made on the spot with Dymo's Midgie Labeler and Dymo tapes. A wide variety of ½-in. wide tapes is available — vinyl plastic, aluminum, monel, copper, stainless steel. When the label is finished it can be attached immediately because of the special pressure-sensitive adhesive backing.
Dymo Corp.

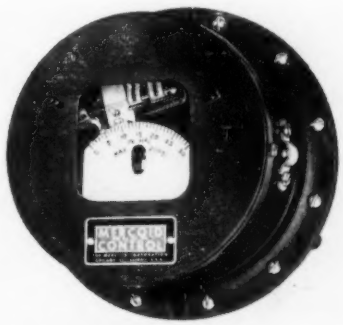
13. Forged steel fittings

The Bonney Sweepolet is a forged, integrally reinforced, insert butt welding pipe fitting specially designed for use on high yield pipe in the gas and oil transmission industries. The fittings assure maximum efficiency of metal placement with minimum weld; optimum distribution of stresses due to both internal pressure and externally imposed loads.
Bonney Forge & Tool Works



14. Control instrument

A compact "package" instrument for controlling process pressures or temperatures in general industrial applications is being produced by Fulton Sylphon division. The Fultro-Matic controller-positioner-valve combination is pneumatically operated and designed to meet processing requirements for a proportioning type temperature or pressure controller.
Fulton Sylphon Division



15. Diaphragm control

Mercoid's new low pressure diaphragm control is for gases or air. It features external adjustment, calibrated dial with pointer, visible on-off circuit, and a sealed mercury contact switch. Available is a fully automatic type where the circuit opens or closes on increase of pressure. A semi-automatic type which automatically opens or closes circuit on increase of pressure requires manual reset.
Mercoid Corp.

16. Temperature readout

A new temperature readout accessory for recording column or sample inlet temperatures directly on gas chromatograph charts is announced by Beckman Instruments. The readout accessory is for installation on 1-millivolt recorders to provide rapid selection of normal gas chromatograph detector readout of either of the two temperature measuring circuits.
Beckman/Scientific

17. Ranges

Three Gourmet models, all bearing the Gold Star designation, head Roper's 1959 line. Shown here are (from left) the 40-in., 36-in., and 30-in. versions. Features include a recently developed top burner, the Circle-Simmer, and an improved version of Roper's Rotis-O-Grill.
Geo. D. Roper Corp.

18. Chromatograph

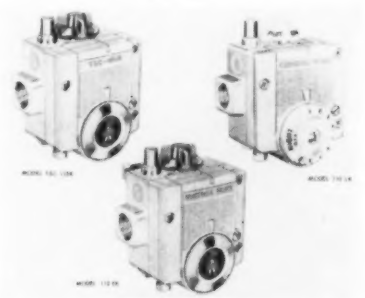
New high-temperature chromatograph developed by Consolidated Electrodynamics separates and analyzes substances with boiling points up to 600 deg. C. It has a maximum operating temperature of 500 deg. C. The instrument was especially designed for laboratory analysts and researchers, particularly in the petroleum, petrochemical, and chemical industries.
Consolidated Electrodynamics

19. Compression couplings

Smith-Blair's new line of compression couplings joins ½- through 2-in. iron pipe. The couplings have high grade cast malleable iron sleeves and end nuts, and are standard equipment with wedge-type rubber gaskets. They come in both short sleeve and long sleeve lengths.
Smith-Blair Inc.

20. Glycol pump

Kimray has a new larger glycol pump, Model 45015 PV, with a 450-gph capacity. The new pump circulates glycol in a closed system gas dehydration unit. Power source is wet glycol and a small quantity of gas at absorber pressure.
Kimray Inc.

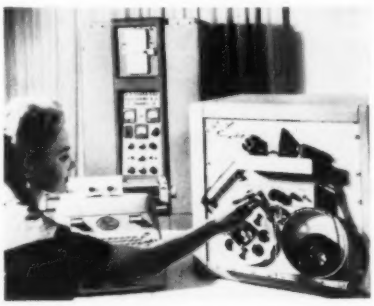


21. Small appliance control

An ultra-compact series of controls for smaller appliances has been introduced by Grayson. Basic in the new series is the TSC-110R, a manually operated control for use on console heaters, bathroom heaters, and vented and recessed wall heaters. Also available in the series is a snap-action hydraulically operated thermostat for automatic control.
Grayson Controls

22. Sideboom

Midwestern's new sideboom is designed for use on rubber-tired tractors. With a lifting capacity of 7000 lb, the sideboom features all-hydraulic operation and a friction clutch for free spooling the load line. At present the sideboom is designed for use on the Oliver 770 industrial wheel tractor.
Midwestern Manufacturing Co.



23. Tape reader

A new photo-electric paper tape reader has been added to the G-15 computer accessory line by Bendix Computer. Capable of accepting any five, six, or seven channel numeric tape for computer input, this unit is ideal for reading tapes from all types of off-line recording devices.
Bendix Computer Division.

24. Built-in line

Chambers' 1959 line of built-in appliances is coordinated in color,

FOR MORE INFORMATION

about New Products in this Issue . . . . .

Each New Product or Trade Literature item reviewed in this issue is numbered. Circle the corresponding numbers on the Readers' Service Card; then PRINT your name, title, company and address plainly and drop the card in the mails (no postage is needed).

USE THESE POSTAGE FREE POST CARDS

Circle the number of the item requested

FIRST CLASS PERMIT NO. 6955 Los Angeles, Calif.

BUSINESS REPLY CARD
No postage necessary if mailed in the United States

POSTAGE WILL BE PAID BY

GAS **Magazine, Readers' Service Dept.**
198 SOUTH ALVARADO STREET
LOS ANGELES 57, CALIFORNIA

GAS READERS' SERVICE DEPARTMENT

Please send me further information about the items circled below . . . .

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	35
36	37	38	39	40	41	42
43	44	45	46	47	48	49
50	51	52	53	54	55	56
57	58	59	60	61	62	63

• *Please Print*

NAME _____

TITLE _____

COMPANY _____

ADDRESS _____

CITY & STATE _____

April, 1959 • **Void after 90 days**

GAS READERS' SERVICE DEPARTMENT

Please send me further information about the items circled below . . . .

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	35
36	37	38	39	40	41	42
43	44	45	46	47	48	49
50	51	52	53	54	55	56
57	58	59	60	61	62	63

• *Please Print*

NAME _____

TITLE _____

COMPANY _____

ADDRESS _____

CITY & STATE _____

April, 1959 • **Void after 90 days**

FIRST CLASS
PERMIT NO. 6955
Los Angeles, Calif.

BUSINESS REPLY CARD
No postage necessary if mailed in the United States

POSTAGE WILL BE PAID BY

GAS **Magazine, Readers' Service Dept.**

198 SOUTH ALVARADO STREET
LOS ANGELES 57, CALIFORNIA

FOR MORE INFORMATION

about New Products in this Issue . . . . .

Each New Product or Trade Literature item reviewed in this issue is numbered. Circle the corresponding numbers on the Readers' Service Card; then PRINT your name, title, company and address plainly and drop the card in the mails (no postage is needed).

FIRST CLASS
PERMIT NO. 6955
Los Angeles, Calif.

BUSINESS REPLY CARD
No postage necessary if mailed in the United States

POSTAGE WILL BE PAID BY

GAS **Magazine, Readers' Service Dept.**

198 SOUTH ALVARADO STREET
LOS ANGELES 57, CALIFORNIA

GAS READERS' SERVICE DEPARTMENT

Please send me further information about the items circled below . . . .

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	35
36	37	38	39	40	41	42
43	44	45	46	47	48	49
50	51	52	53	54	55	56
57	58	59	60	61	62	63

• *Please Print*

NAME_____

TITLE_____

COMPANY_____

ADDRESS_____

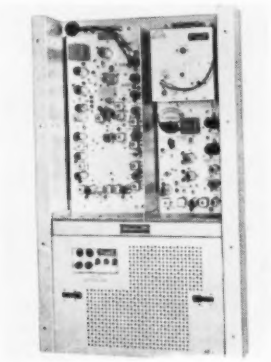
CITY & STATE_____

April, 1959 • **Void after 90 days**

USE THESE POSTAGE FREE POST CARDS

Circle the number of the item requested

design, materials, styling and finishes. Featured is the new 33-in. drop-in gas unit which has four burners, counter-top controls and shallow construction, permitting a cutlery drawer underneath. Antique copper, chrome and satin finishes are featured in the four-burner In-A-Top broiler-griddle.
Chambers Built-Ins Inc.



25. FM radio terminal

Pipeline communications, control, and data processing as well as constant contact with other separated operations is possible with the Type 896 FM radio terminal introduced by Radio Engineering Laboratories. Up to six simultaneous toll-quality conversations from suitable multiplex equipment may be handled by the terminal or it may be used for multiple data processing with or without voice channels.
Radio Engineering Labs

TRADE LITERATURE

26. Couplings, fittings

Dresser Manufacturing's new catalog (Form No. 159) describes the use of Dresser couplings, fittings, and pipe repair products on gas mains and distribution systems. Included are product information and installation instructions as well as piping diagrams and product and installation photos.
Dresser Manufacturing Division

27. Ductile iron pipe

A new 36-page illustrated catalog describes the complete line of American ductile iron products made by American Cast Iron Pipe. Valuable technical information, including grades, specifications, dimensions and weights, uses and applications, is contained.
American Cast Iron Pipe Co.

28. Filter catalog

Dollinger's great variety of filters for industrial use are covered in a new 4-page bulletin. Featured is Dollinger's special pipeline filter to handle high pressure gas. Also, the company's liquid, intake, dry and viscous panel and Duphase filters, as well as the precipitators and electro-Staynew mist collector.
Dollinger Corp.

29. General purpose computer

A new brochure (S-526R1) on the LGP-30 general purpose computer gives specifications and basic features, illustrates major components, and lists applications. Operation of control panel and simple 16-part command table are described.
Royal McBee Corp.

30. Wheel-type trencher

The economy model 130 Trenchliner is covered in a new four-page bulletin from Parsons. A wheel-type machine, the 130 digs trenches 12 to 24 in. wide at depths to 5¾ ft. Two pages of the bulletin are devoted to photos and feature-by-feature explanations.
Parsons Co.

31. Compressor advances

Five new advances achieved by Clark research to increase operating efficiency of reciprocating pipeline compressors are presented in illustrated Bulletin 168. Described are new low ratio compressor cylinders, new poppet-type valves, electronic brain to calculate performance and eliminate guesswork, analog computer to calculate header sizes for optimum flow, and new advances in control and automation.
Clark Bros. Co.

32. Backfiller

Cleveland's big 190 pipeline backfiller—featuring a new water-cooled throw-out clutch—is the subject of a new 6-page, 2-color folder. Action photos show the 190 backfilling heavy spoil on big pipelines.
Cleveland Trencher Co.

33. Equipment leasing plan

A special package lease plan for the gas industry is available from Nationwide Leasing Co. Under the plan, any combination of equipment may be considered one package and leased as a unit for three to five years. It permits firms to acquire $10,000, $25,000, $50,000 or more in equipment without capital investment. Companies can expand and modernize facilities without depleting their liquid working capital.
Nationwide Leasing Co.

34. Literature index

Honeywell's Index of Literature is a 24-page bulletin listing industrial and valve division literature. Covered are product catalogs, specifications, technical bulletins, industry bulletins, systems bulletins, and instrumentation data sheets.
Minneapolis-Honeywell

35. American designs

"13 Outstanding American Designs" has been published by the manufacturer of Mars pencils, sponsor of the annual Mars Outstanding Design Contest. Contains photos with descriptive text of cash prize winners and their designs.
J. S. Staedtler Inc.

36. Gas analysis

M-S-A sample systems, components and filters are described in a new 8-page brochure. The company has developed a line of standard sample system components and accessories for use with M-S-A infra red, thermatron, oxygen, combustible gas, water vapor, and carbon monoxide analyzers.
Mine Safety Appliances

37. One-man trencher

An illustrated 6-page bulletin describes the Arps Trench-Devil, a one-man operated trencher for gas lines. Model M-A digs trenches 2¾ in. to 8 in. wide and up to 54 in. deep. It has digging speeds up to 1200 ft per hr in either direction.
Arps Corp.

38. Two-way conversion

The simplicity of conversion of existing two-way radio equipment to conform with the new FCC split-channel rules is covered in a memorandum issued by DuMont Labs.
Allen B. DuMont Labs

39. Fire retardant coatings

Roskote fire-retardant coatings for thermal insulation materials may be used on any metal, wood and masonry structures where corrosion-resistance and fire-retardancy are necessary. Royston's entry into this field is described in a four-page folder.
Royston Laboratories Inc.

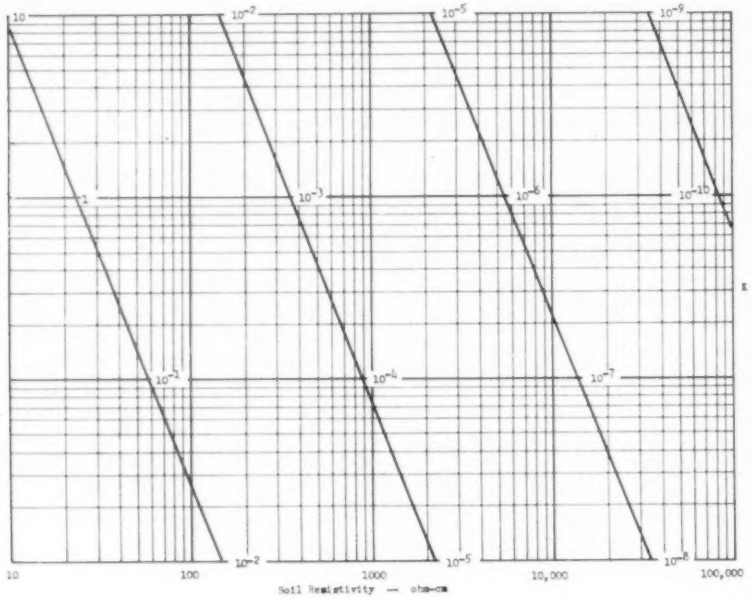
corrosion • *Continued from page 19*

doubtful significance. The surprising feature is that the correlation of n/a is so much lower than that of n alone.

Because of the enormous range in the values of K, it was considered necessary to correlate Log K rather than K itself. As it turned out, this was a reasonably good correlation, with a coefficient of 0.55.

Fig. 7 shows, on a single diagram, the variables i/a and n/a as functions of the resistivity. *Fig. 8* shows K as a function of resistivity, also. From these curves, or from the derived equations, it is possible to obtain the values necessary for writing out the leak rate prediction curve for a soil of any given resistivity within the range.

Fig. 8. Note that value of K shown as 10^{-2} should be 10^{-3}, and the value shown as 10^{-10} should be 10^{-9}.



GAS • ASSOCIATIONS

Operating men head for Cincinnati this month

Bound for Cincinnati this month are some 1000 operating men who will spend four days hearing more than 100 speakers explore the fields of automotive equipment, corrosion, customer service, and distribution.

April 6-9 are the days for the AGA operating section distribution conference. Meeting place is the Netherland-Hilton hotel in Cincinnati.

Three general sessions, each devoted to subjects of general interest are scheduled. In addition, 15 sessions will cover such specific subjects as construction and maintenance, meter installation, testing and repair, distribution design and development, training of street department personnel, automotive electrical equipment, automatic truck transmissions, cathodic protection devices, and air conditioning services.

General session speakers and their subjects include Prof. D. A. Weaver of the motor fleet training program, Public Safety Institute of Purdue University, discussing management control of driver performance; T. Spencer Shore, president, Eagle-Picher Co., delivering a talk entitled "Philosophy for Business"; J. H.

DRESSER®
COUPLINGS

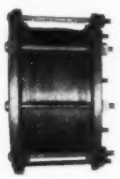
STYLE 38

INSULATING
COUPLINGS

STYLE 39

REDUCING
COUPLINGS

STYLE 62



SOLVE YOUR
PIPE
CONNECTION
PROBLEMS

DRESSER
MANUFACTURING DIVISION
Bradford, Pennsylvania

NEW PRODUCT
ANNOUNCEMENT
DRESSER
2" ST 90
DRESSER®
STOP-N-GO
Trademark
FITTING
LINE CAP
OR
EXTENSION FITTING
CAP your new distribution lines with the "Stop-N-Go" fitting. To extend the line; remove the end nut and line cap, replace the end nut to hand-tightened pressure and stab the pipe into the fitting breaking the diaphragm seal. Wrench tighten the end nut using about 75 pounds pull on a 24" wrench and you get a permanent, gas-tight joint.

One fitting doubles as line cap and main extension fitting

The new Dresser Style 90 "Stop-N-Go" fitting makes utility expansion easy. When you're laying a new 2" distribution line, cap it off with the "Stop-N-Go"; when you're ready to extend the line, a simple manual operation converts it into a main extension fitting. One fitting for two jobs! Saves money, time, and extensions can be made without shutting off the main (pressures should not exceed 30 psi while extension is being made).

Like all Dresser Fittings, the "Stop-N-Go" makes a permanent leakproof joint with no threading or welding of pipe, takes up to 6° of misalignment and axial deflection, and is rapidly and easily installed with only a wrench. The standard Dresser warranty applies to this and all Dresser products. For further information and specification data on the "Stop-N-Go," write for free bulletin, Dresser Manufacturing Division, Bradford, Pa.

"Dresser" and "Stop-N-Go" are trademarks of Dresser Manufacturing Division.

DRESSER RESEARCH SERVES THE GAS INDUSTRY

Bradford, Pennsylvania
Chicago
Houston
New York
S. San Francisco
Toronto & Calgary

DRESSER
MANUFACTURING DIVISION

ONE OF THE DRESSER INDUSTRIES

ELIMINATE MAJOR REPAIRS

WITH

AMERICAN® WELDED STEELCASE METERS

- Tinned Steelcase Accuracy
- Hardcase Durability
- Maintenance Economies

American Welded Steelcase Meters provide a new approach to the economics of meter maintenance and retirement. Major repairs are eliminated. Minor adjustments are easy to make – assuring long service life at lowest maintenance costs.

Ask your American Meter representative for full details about Welded Steelcase Meters and their many advantages for all fuel gas services.

W-75	Rated cap. 75cfh – FOB Philadelphia
W-175	Rated cap. 175cfh – FOB Fullerton, Cal.
W-210	Rated cap. 210cfh – FOB Philadelphia
W-250	Rated cap. 250cfh – FOB Philadelphia
W-300	Rated cap. 300cfh – FOB Philadelphia
W-45-LPG	Rated cap. 45cfh* – FOB Philadelphia
WC-45-LPG	Rated cap. 45cfh* – FOB Philadelphia

*propane

Rated capacities at ½-inch w.c. differential with 0.64 sp. gr. gas – 5 psi working pressure.

AMERICAN® METER COMPANY

INCORPORATED (ESTABLISHED 1836)

General Offices: Philadelphia 16, Pa.

Sales offices in principal cities

Beatty, Laclede Gas Co., discussing photography in customer service work; T. J. Miller, Michigan Consolidated Gas Co., reinforcement of compression joints; G. G. Wilson, Institute of Gas Technology, prevention of corrosion in stored pipe and lab evaluation of internal pipe coatings for natural gas service; G. J. Sandusky, Southern California Gas, whose talk is entitled "The Rubber Yardstick"; N. T. Shideler, Pittsburgh Coke & Chemical Co., describing pipeline coatings—present and future; G. G. Dye, SoCal, reporting on his company's program for the training and testing of distribution welders; P. B. Tarman and H. R. Linden, both of IGT, reporting on research on soil adsorption of odorants.

Accent on research at SGA's 51st convention

Research—and the new methods and products that result from it—will be accented at the 51st annual convention of the Southern Gas Association, slated for New Orleans, April 27-29. L. H. Ernst, Caloric Appliance Corp., Atlanta, is general convention chairman.

One of the highlights of the convention will be demonstration of Whirlpool Corp.'s miracle all-gas kitchen. Some hints of other "miracles of tomorrow" which are being developed in the laboratories of today will be given by other speakers. The industry's new Gold Star program also will be spotlighted. One entire session will be devoted to gas air conditioning.

Among speakers the 2000 expected delegates will hear are: J. Theodore Wolfe, AGA president and president of Baltimore Gas & Electric; Stephen F. Dunn, vice president for government relations of the National Association of Manufacturers; and Tony Whan, senior vice president of Pacific Outdoor Advertising Co., Los Angeles, oft-time winner of "salesman of the year" awards.

Serving on the convention committee as vice chairmen are Ernest G. Hotze, Clark Bros. Co., Houston and George D. Guler, Minneapolis-Honeywell, Atlanta. Other chairmen are: W. M. Nunn Sr., New Orleans Public Service Inc., arrangements; Frank Barragan Jr., South Atlantic Gas, attendance; Paul B. Payne, Dearborn Chemical Co., friendship hour; Mrs. J. H. Collins Sr. and Mrs. A. B. Paterson, ladies entertainment; Jack A. Bell, Gas Light Co. of Columbus, Ga., publicity; and J. T. McKay, NOPSI, registration.

Gas dispatching session set for transmission meet

The gas dispatching committee of the AGA will present a program at the May 18-19 transmission conference in Dallas. H. B. Lafferty, chief dispatcher for El Paso Natural Gas Co., is serving as chairman of the committee.

The session, slated for the afternoon of May 19, will feature a discussion of progress in solar weather research by Dr. Walter Orr Roberts of the High Altitude Observatory in Boulder, Colo.

A progress report on "Automatic Otto", the name given to the supervisory and remote control equipment installed a year ago by Hope Natural Gas Co., will be presented by A. W. Foster, Consolidated Natural Gas System, Clarksburg, W. Va., and C. E. Pettry, United Fuel Gas Co., Charleston, W. Va.

Gene Fulke, chief dispatcher of Columbia Gulf Transmission Co., will discuss remote controlled and unattended compressor stations. Columbia Gulf's first remote-controlled, unattended station also will be one year old at the time of the program.

W. A. Shipman of Columbia Gas System Service Corp. and L. J. Rankine of International Business Machines Corp., will discuss computer applications to operations.

AGA planning area development program

The need for gas industry sponsorship of an area development program was explored recently by a task force of AGA's industrial and commercial gas section. As a result of the meeting, the association is working on a proposed program that will be coordinated with both section activities and those of the public information bureau.

It is anticipated that a new area development committee will be formed shortly to serve the entire industry.

A program of a local gas company to secure new industry can have far-reaching ramifications in promoting residential and industrial gas services: When a new industry with 100 employees is

introduced in a community, it means: 296 more people, 112 more households, 51 more school children, 107 more passenger cars registered, 174 more workers employed, and 4 more retail establishments.

Objectives of the new committee:

1. Promoting area development idea to the gas industry.
2. Conducting workshops to provide a forum for the sharing of ideas and to inform gas companies on area development techniques.
3. Coordinating area development with other AGA activities.

Commercial, industrial group meets April 7

A record-breaking number of industrial and commercial gasmen, sales executives and manufacturers are expected to turn out for the April 7-9 sales conference on industrial and commercial gas. This year's session will be held in the Hotel Warwick in Philadelphia.

Commercial gas subjects are scheduled for April 7; a general session will be held on April 8; and the closing day, April 9, will be industrial gas day.

Appalachian school covers underground corrosion

The fourth annual Appalachian Underground Corrosion Short Course will be held June 2-4 at West Virginia university's School of Mines in Morgantown.

Both technical and non-technical presentations of the practical and theoretical aspects of corrosion will be presented, together with field demonstrations and exhibits by 38 manufacturers and suppliers.

Additional information on the short course is available from J. H. Alm, Dearborn Chemical Co., Room 605, Two Gateway Center, Pittsburgh 22.

Florida-Georgia gasmen plan spring conference

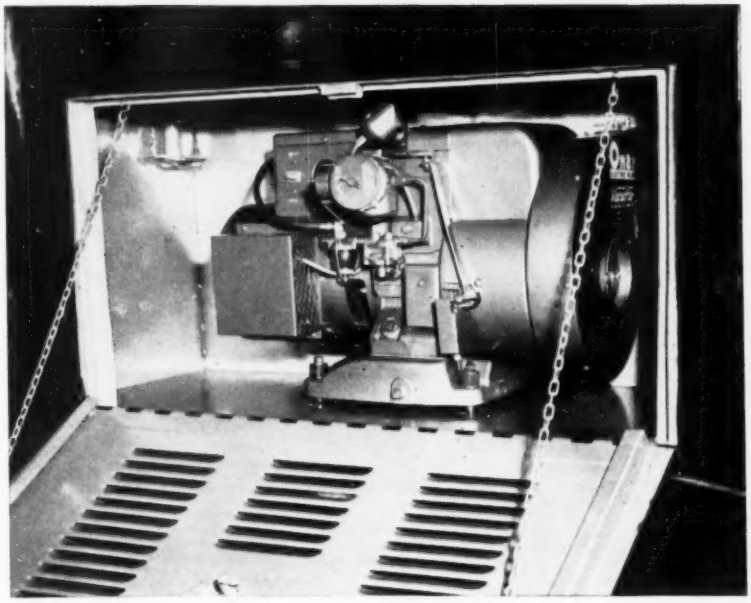
May 20-23 are the dates of the Florida-Georgia Gas Association's spring conference. Sessions will be held at the Fort Harrison hotel in Clearwater, Fla.

According to L. A. Friederich, secretary-treasurer of the group, these broad subjects will be covered: meters, distribution, customer service, and sales.

Onan ELECTRIC PLANTS

ELECTRIC PLANT NEWS

Onan ELECTRIC PLANTS



New dual-purpose Onan plants deliver A.C. power for tools; 30 amps for battery charging!

1,000 and 2,000-watt models available

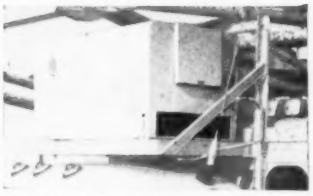
Mounted in maintenance and construction vehicles, these two new Onan Electric Plants cut costs two ways.

First, they provide plenty of plug-in A.C. power for floodlights and motor-driven tools.

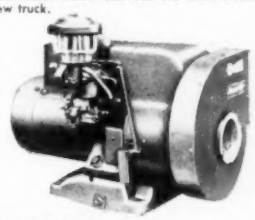
Second, they keep communication batteries charged without running the truck engine. The 30-ampere, 12-volt output handles the drain of 2-way radio and battery-powered lighting.

The difference in fuel cost between the single-cylinder Onan engines in the 2 to 4 H.P. range and truck engines of 150 H.P. or more has been reported as high as $800.00 per year or approximately twice the cost of the 1KW plant. To these fuel savings must be added savings in engine maintenance and reduction in labor costs.

These plants can be mounted within the truck body or above the cab in an Onan weatherproof steel housing. Leading body builders will install them to order. Plants are electrically started from the truck cab. Separate charging circuit keeps starting batteries charged. Call your Onan distributor for the whole story.



OVER-THE-CAB MOUNTING
Protected by Onan steel housing. Plant easily accessible. Entire unit can be transferred to new truck.



MODEL 1AJ-1RV1330
1,000 watts, 115 volts, 60-cycle with 30-amp. 12-volt battery charging output. One-cylinder, air-cooled Onan AJ engine.

See your Onan distributor or write for information

D. W. ONAN & SONS INC.

2857 University Ave. S.E., Minneapolis 14, Minnesota

ELECTRIC PLANTS • AIR-COOLED ENGINES • KAB KOOLER • GENERATORS

Onan ELECTRIC PLANTS

LOW AND NARROW!

Parsons® 77 Trenchliner®

It's not much wider than a yardstick...

. . . only 3 feet-10 inches wide, to be exact! What's more, this new 77 is just 5 feet-8 inches "low" with the boom in digging position. It only weighs about 6700 lbs., for convenient trailer-transport from job to job.

Trench depths to 5 feet

Small in size, but big in capacity, Parsons 77 has a work range that will surprise you. It produces from 4.4 inches to 21 lineal feet of trench per minute, in 32 hi-lo digging speed selections. You get trench widths from 6 to 18 inches — *and maximum digging depth of 5 feet!*

The tiny 77 is heavy-duty in every respect. It has positive down-crowd on telescopic ladder boom. Self-cleaning, cast steel buckets have self-sharpening removable point-type teeth. Shiftable conveyor is instantly reversible for controlled discharge. Compact and maneuverable, the 77 turns within its own length — each crawler is independently driven, independently braked. Better check what this small utility Trenchliner can do on your service lines, small mains, footings, etc. Ask Parsons distributor for demonstration, or write to us for literature.

A big, expensive rig isn't needed to transport this little 77 Trenchliner from job to job. Its low height and weight of only 6700 lbs. — permit fast one-man trailer loading — hauling under low overhead clearances. (Big ladder and wheel-types are also available.)

Mail to: PARSONS Company, Newton, Iowa *for literature on 77 Trenchliner*

NAME ..... TITLE .....

COMPANY ..... DIV. .....

STREET .....

CITY ..... STATE .....

P919 GAS

PARSONS Company • NEWTON, IOWA

A DIVISION OF KOEHRING COMPANY

GAS·PEOPLE

William Gartz
Peoples Nat

D. M. McDowell
Roots-Connersville

WILLIAM R. GARTZ has been named industrial sales manager of the Peoples Natural Gas Co., Pittsburgh. Gartz is a 12-year veteran in the company's industrial sales section.

D. M. MCDOWELL has joined Roots-Connersville Blower Division of Dresser Industries as director of engineering. McDowell's 20 years' experience in engineering and management include work in all major engineering department functions, with special emphasis on research and development of new products. McDowell comes to the Connersville, Ind., firm from the Le Roi Division of Westinghouse Air Brake Co.

CARL A. ANDERSON, former vice president in charge of Minneapolis-Honeywell's Aeronautical division in Canada, has been named general manager of the company's recently acquired Marion Electric Instrument Co., Manchester, N. H.

L. C. PESCHEL, controller of Mountain Fuel Supply Co., Salt Lake City, has been elected a director. He replaced L. Clyde Olpin, who resigned recently.

J. F. HINCHEY has been named field engineering manager for Burroughs Corp.'s ElectroData Division, Pasadena, Calif. He succeeds J. F. KALBACH, who is now associate director of engineering. Succeeding Hinchey as manager of quality assurance is R. W. ANDERSON.

WILLIAM B. POOR has been elected senior vice president of Ford, Bacon & Davis Inc., New York.

LESTER WILDMAN has been named general promotion representative

for Oklahoma Natural Gas Co. in Tulsa. He joined Oklahoma Natural in 1955 as sales representative in Oklahoma City. Since 1957 he has been sales representative in Norman.

D. REX SCOTT has been named assistant general manager of Robertshaw - Fulton Controls Co.'s Western Research Center in Anaheim, Calif. Before his new assignment, Scott was director of planning and before that he was district sales manager in the company's Cleveland office.

HARRY C. WALTON, industrial and sales engineer for Commonwealth Natural Gas Corp., Richmond, Va., has retired because of ill health. The 40-year veteran in the gas industry started in 1919 with the old Louisiana Gas Co. He joined Commonwealth in 1952, two years after it started operations, and was responsible for much of its industrial and commercial development work.

JOHN E. DAUGHERTY has been named sales manager, international department, Robertshaw - Fulton Controls Co., Richmond, Va.

MRS. MARJORIE LILLENBERG has been appointed home service manager of the Peoples Natural Gas Co., Pittsburgh. Mrs. Lillenberg was home service director of Oklahoma Natural Gas Co. before her recent appointment.

GENE ALBERT has been named assistant product manager for the Vulcan Rubber Products Division of Reeves Brothers Inc., New York. Before his recent appointment, Mr. Albert was sales representative for Vulcan products on the eastern seaboard.

Following merger with Harsco Corp., new officers of Capital Manufacturing Co. division were announced. SAMUEL M. MELTON is

D. R. Scott
Robertshaw

Gene Albert
Vulcan

48′ BORE under highway for distribution line

with KA-MO 12″ dia. drill

To run a gas distribution line under main highway, a portable Ka-Mo horizontal drilling unit quickly bored a 12" diameter hole, 48′ long, through hard compacted clay. Drill was powered by a 7½ h.p. air motor on standard double-track mounting. On similar type work, casing can be installed at the time hole is drilled, by using the casing attachment — giving maximum protection against costly cave-ins.

Ka-Mo offers tremendous versatility . . . light, portable drills . . . easy to operate for installing gas lines under streets, highways, railroads. Drills through sand, clay, gumbo, frost, shale, limerock, other mineral formations. Air, electric, hydraulic, diesel, gasoline engine powered.

100′ BORE and casing installation for gas main

This 20" diameter Ka-Mo drill was used inside casing to bore a hole 100′ long through hard clay, under a railroad bed for new gas main. Drill was powered by a 15 h.p. air motor. Notice that drill and casing move forward at the same time.

Next time you have a drilling problem, check the Ka-Mo line. Drill sizes 2" to 48" dia. and larger, in sectionalized lengths are tailored to meet your own particular requirements. Information is available at no obligation. Fill out and mail coupon today.

Mail to: KWIK-MIX Co., Ka-Mo Tools Dept., 1845 South 55th Ave., Cicero 50, Ill.

☐ Send us free 12-page KA-MO bulletin ☐ Have distributor call

NAME ..... TITLE .....

COMPANY .....

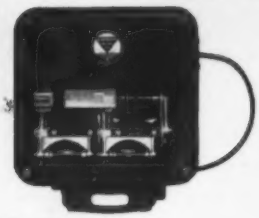
STREET .....

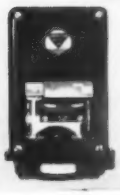
CITY ..... STATE .....

KAM906 GAS

KA MO KWIK-MIX COMPANY — Ka-Mo Tools Dept.
A DIVISION OF KOEHRING COMPANY

FOR ACCURATE
FLOW MEASUREMENT
365
DAYS A YEAR





USE AMERICAN® BASE VOLUME AND BASE PRESSURE INDEXES

American BASE VOLUME INDEXES register gas quantity at standard conditions of base temperature and base pressure. BASE PRESSURE INDEXES automatically multiply volume at line conditions by the pressure factor and indicate quantity at base pressure on a straight reading index.

No computations...accurate gas volumes at base conditions are shown immediately. A second counter on the back indicates volume at line conditions. Simple operating principle... integration is continuous with all functions performed mechanically through special gearing.

Write for Bulletins 200 and 201.

AMERICAN® METER COMPANY
INCORPORATED (ESTABLISHED 1836)
General Offices: Philadelphia 16, Pa.
Sales Offices in Principal Cities

president. HERMAN M. KATZ has been appointed vice president and general manager. GEORGE M. LEVINE, formerly sales manager, and SANFORD W. LIPSON, formerly plant manager, are now vice presidents in charge of sales and production, respectively. HUGH MASONI, ROBERT SCHAEFER, STANLEY H. KATZ and M. P. MELTON have been appointed assistant sales manager.

W. R. LONERGAN has been named manager of product planning and market analysis for the marketing division of Burroughs Corp's. ElectroData Division, Pasadena, Calif.

W. H. ROYAL has been promoted to manager of the Denver office for M. J. Crose Manufacturing Co., Tulsa. Royal joined the Crose sales department last year in Tulsa. In his new assignment, he will be in charge of Crose sales-service activities throughout the western part of the country.

W. H. Royal
Crose

E. W. Murray
Robertshaw

WILLIAM GOLDING has been appointed utility administration coordinator for Norge Division of Borg-Warner Corp., Chicago. The company also named EDWARD A. LEARY national sales promotion manager.

D. E. BRUBAKER has joined A. Y. McDonald Mfg. Co. as advertising and sales promotion manager. He will headquarter in Dubuque, Iowa. E. J. MIQUELON has been promoted to assistant sales manager.

T. L. JOHNSON has been named vice president-sales of McWane Cast Iron Pipe Co., Birmingham. For the past 25 years, Johnson has been sales manager, Pacific States Cast Iron Pipe Co., Provo, Utah, an affiliate of McWane. He succeeds W. P. COX, who has retired after 37 years as head of McWane's sales department.

E. W. MURRAY is district sales manager in St. Louis for Robertshaw Thermostat Division of Robertshaw-Fulton Controls Co. Murray joined Robertshaw in 1954. Most recently he was in the firm's Cincinnati sales office.

ROY T. OMUNDSON is a newly elected vice president of Chemetron Corp., Chicago. He is president of the company's recently formed Cardox Division.

LEONARD R. WREN has joined White-Rodgers Co., St. Louis, as sales engineer in the field sales organization. He will work out of the newly formed Seattle sales area, covering Washington, Idaho, western Montana, and Alaska.

RALPH A. PURCELLI, executive assistant to the general manager of Rockwell Manufacturing Co.'s Barberton, Ohio, plant has been named general manager of the company's Porterville, Calif., plant. He replaces CHARLES N. PERRY, who has resigned.

Ralph Purcelli
Rockwell

John Croft
Ohio Fuel

DAVID PACKARD, co-founder and president of Hewlett-Packard Co., Palo Alto, Calif., is a newly elected director of Pacific Gas & Electric Co., San Francisco.

JOHN T. PINKSTON has been named to the newly created post of process consultant of United Engineers & Constructors Inc., Philadelphia. He will be in charge of process development activity for the firm.

JOHN C. HELIES has been appointed general manager for Security Engineering Division, one of the Dresser Industries, Dallas. Helies, Security's executive vice president, also assumes the responsibilities of general management following the resignation of C. L. LANE as president and general manager.

E. R. CAREY has been promoted to assistant sales manager, regular products, of Dresser Manufacturing Division, Dresser Industries Inc., Bradford, Pa. He is succeeded as manager of general market sales by JOHN P. LORD, formerly business manager for welding fittings.

JOHN A. CROFT, former distribution department general engineer for Ohio Fuel Gas Co., Columbus, has been promoted to supervisory engineer and Columbus Group system sponsor for the Columbia Gas System Service Corp. in New York. From his New York headquarters, he will act as liaison man between Ohio Fuel and the Service Corp. in his new post.

ROBERT F. PROBST, secretary of the Connecticut Light & Power Co., Berlin, is a newly elected vice president of the company. He continues to serve as secretary.

E. R. Carey
Dresser

J. P. Lord
Dresser

E. P. BEST is director of metallurgy and research for A. M. Byers Co., Pittsburgh. Named chief wrought iron metallurgist at the same time was T. D. BONNER.

J. V. S. NORTON is the newly named assistant sales manager, eastern region, for Bucyrus-Erie Co., So. Milwaukee. For the past 21 months, Norton has been assistant export sales manager. He is now headquartered in New York.

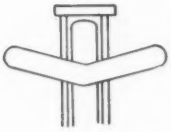
ARCHIE C. ANDERSON has been named technical director of A. O. Smith Corp.'s new Reinforced Plastics Division. The Milwaukee-based division also named DWIGHT H. DAVIS as controller and administrative assistant.

Several executive appointments for Holan Corp. and Holan Corp. of Georgia have been made. At Holan headquarters in Cleveland, HERMAN J. TROCHE moves up from

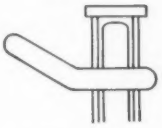
Cleveland "J" digs 20'/m through scored pavement

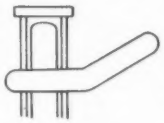
This Cleveland J-20, digging for 4 and 6-inch pipe on a Colorado utilities job, averaged 20 feet per minute as it cut through scored pavement and 8 inches of frost. Note the clean neat cut through paving and frost. Contractor's report indicates he was particularly pleased with the J-20's easy maneuverability as well as its high production on this job. *All* operations of the J-20 are controlled at the operator's seat.

V Conveyor
...permits faster, higher spoil discharge, higher heaped loads without clogging.



Hydraulic Conveyor Shift
...permits digging past poles, trees, etc., without interrupting other operations.

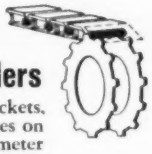




Independent Hydraulic Drive
...controls conveyor speeds and direction of discharge.

Hydraulic Crumbing Shoe
...optional, extra... pivots upward... allows setting wheel to required depth at walks, drives, underground obstructions.

World's Finest Trencher Crawlers
...double flanged sprockets, wheels, rollers...drives on each end of 1½" diameter hardened pins...eliminates plugging...sealed ball and roller bearings...1,000-hour lubrication...a tremendously long-lived, easy-rolling track.



Get Bulletin L-104 on Cleveland "J" trenchers from your local distributor ...or write:

The CLEVELAND TRENCHER Co.

20100 ST. CLAIR AVE. • CLEVELAND 17, OHIO

Good Everywhere ®

STOP H_2S CORROSION BEFORE IT STARTS!

The Connelly IRON SPONGE purification process at the well site removes hydrogen sulphide BEFORE the gas is piped to central processing. Thus, the cause of pipe line corrosion is eliminated because corrosive gas never enters the transmission lines. Additionally, Connelly IRON SPONGE eliminates the need for extreme close control. It operates with high efficiency at low or high pressures—absorbs more H_2S, gives longer service between foulings and is easily regenerated. If you have a purification problem check this MOST ECONOMICAL solution today. Write for Field Processing Bulletin #OG-7.

CONNELLY

Incorporated

3164 S. CALIFORNIA AVE.

CHICAGO 8, ILLINOIS

Elizabeth, New Jersey

vice president-engineering to vice president and consultant. GEORGE H. ECKELS is the new vice president-engineering. ROBERT R. RECTOR succeeds Eckels as vice president and general manager at Holan of Georgia. He was formerly vice president-sales and continues to direct sales there. Also in Georgia, O. H. STELTER JR. is now vice president-engineering and manufacturing and CLIFFORD BOOKER is secretary and treasurer.

Quick-Way Truck Shovel Co., Denver, has elected new officers and directors. GILBERT S. RIGDON, who also serves as executive vice president of H & B American Machine Co. Inc., was named executive vice president of Quick-Way. On the board are ALFONS LANDA, ROBERT C. FINKELSTEIN, DAVID E. BRIGHT and Mr. Rigdon. Finkelstein is president, WALTER L. LAMPL is vice president; HENRY L. HEYMANN is secretary, JOHN E. GORSUCH is assistant secretary and DAVID E. BRIGHT is treasurer.

DANIEL L. CRONIN, former Toledo district dealers sales manager for Ohio Fuel Gas Co., has been named Oberlin local agent for the company. He replaces M. E. VERNON, who recently was promoted to Sandusky local manager.

CHARLES SCHAEFER is the newly named general sales manager of the Permanent Filter Corp., Los Angeles. In addition to directing overall sales activities, Schaefer will spearhead a major effort aimed at achieving commercial sales of the company's Perma-Dry water separation and filtering units.

ROBERT R. REED is regional sales manager of the Gulf area for Lone Star Steel Co., Dallas. He will work out of the Houston office.

WILLIAM J. FOUNTAIN has joined Consolidated Natural Gas Co. as an attorney in the New York office.

PAUL E. COOK has been named junior salesman in the Michigan territory of Hays Manufacturing Co., Erie, Pa. The company also appointed FREDERICK S. WILLSON as sales representative in the territory comprising Illinois, Indiana, and Kentucky.

PAUL L. FENTRESS and JOSEPH E. RICH are newly elected directors of Dearborn Chemical Co., Chicago. Fentress is vice president and director of Baker Fentress Investment Co., Baker Fentress Co., and Consolidated Naval Stores Co., and a director of the Medford Corp. Rich is president and director of Morton Chemical Co. and a director of Simoniz Co.

PAUL A. YETTER has been reassigned from vice president of Public Service Co. of Colorado's division operations to vice president in charge of public relations activities. RALPH SARGENT JR. has been named manager of division operations, succeeding Yetter. Sargent has served as assistant to the president since April 1956. In his new post, Yetter will be in charge of the company's advertising, employee and public information departments along with other related assignments.

I. MORRISON has been named president of Morrison Steel Products Inc., Buffalo, N. Y. Newly named executive vice president is M. J. KOHNSTAMM.

D. E. O'CONNOR and T. J. MERRITT have joined the Houston engineering department of Commonwealth Services Inc. O'Connor will act as chief engineer in the office and Merritt will be responsible for industrial engineering.

RALPH A. SMITH is chief materials and test engineer for Fulton Sylphon Division, Robertshaw-Fulton Controls Co., Knoxville, Tenn.

JOHN F. ROBERTS JR. is now manager of Pacific Gas & Electric Co.'s rate department, succeeding RUDOLPH JENNY, who is retiring. Jenny, PG&E's rate manager since 1948, joined the San Francisco company 47 years ago. Roberts, with PG&E since 1937, has been in the rate department since 1940.

Neptune Meter Co., New York, has reorganized its sales territories in the Philadelphia-Washington area. New assignments include: H. A. LENTZ, handling Superior gas meters and Neptune petroleum and industrial meters in Wilmington, Baltimore, and Washington; ED GAME, handling Superior gas meters in parts of Pennsylvania, Delaware, Maryland, Virginia, and West Virginia.

WALTER E. MCWILLIAMS has been appointed assistant general sales manager of the Peoples Natural

Continued on page 110

GAS CALENDAR

April

1- 3. GAMA Annual Meeting—The American Hotel, Bal Harbour, Fla.

6- 9. AGA Operating Section Distribution Conference—Netherland-Hilton Hotel, Cincinnati.

7- 8. Gas Compressor Institute (Sponsored by University of Kansas and Southwest Kansas Petroleum Industry)—Randall's Cafeteria, Liberal, Kan.

7- 9. AGA Sales Conference on Industrial & Commercial Gas—Hotel Warwick, Philadelphia.

14-16. Southwestern Gas Measurement Short Course—Drill Hall, North Campus, University of Oklahoma, Norman, Okla.

15. AGA Mid-Eastern Public Relations Workshop—Emerson Hotel, Baltimore.

16. Pennsylvania Gas Association Production Conference—Drexelbrook Swimming & Tennis Club, Drexelbrook, Pa.

20-22. AGA-EEI Accounting Section Conference of Electric & Gas Utility Accountants—Sherman Hotel, Chicago.

21-22. Pacific Coast Gas Association Customer Service Conference—Phoenix, Ariz.

22-23. PCGA Accident Prevention Conference—Phoenix.

22-24. Indiana Gas Association—French Lick-Sheraton Hotel, French Lick, Ind.

22-24. Natural Gasoline Association of America 38th Annual Convention—Baker & Adolphus Hotels, Dallas.

27-29. Southern Gas Association Annual Convention—New Orleans.

29-30. PCGA Transmission Conference—El Mirador Hotel, Palm Springs, Calif.

May

5- 6. PCGA Distribution Conference—Mar Monte Hotel, Santa Barbara, Calif.

5- 7. AGA Research & Utilization Conference—Hotel Carter, Cleveland, Ohio.

6- 8. Public Utilities Advertising Association Annual Convention—Sheraton Hotel, Dallas.

11-12. AGA Eastern Gas Sales Conference—The Netherland-Hilton Hotel, Cincinnati.

18-19. AGA Operating Section Transmission Conference—Statler-Hilton Hotel, Dallas.

18-20. AGA-Mid-West Regional Gas Sales Conference—Edgewater Beach Hotel, Chicago.

19-21. Pennsylvania Gas Association—Pocono Manor Inn, Pocono Manor, Pa.

20-21. PCGA Home Service Workshop—Hotel Utah, Salt Lake City.

20-23. Florida-Georgia Gas Association Spring Convention—Fort Harrison Hotel, Clearwater, Fla.

21-22. Natural Gas & Petroleum Association of Canada—Hamilton, Ont.

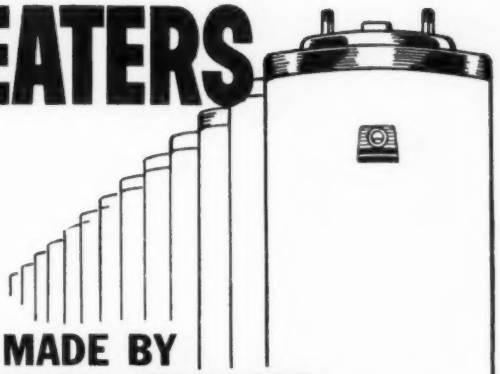
25-27. AGA Operating Section Production Conference—Hotel Sheraton, Rochester, N. Y.

June

2- 4. Appalachian Underground Corrosion Short Course—University of West Virginia School of Mines, Morgantown.

14-16. AGA-INGAA National Public Relations Conference—Edgewater Beach Hotel, Chicago.

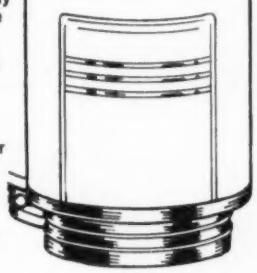
THERE IS ONLY ONE LINE OF PERFORMANCE RATED WATER HEATERS



IT'S MADE BY AMERICAN-STANDARD

THE PEOPLE WHO KNOW PLUMBING AND WATER HEATING BEST!

- With Performance Rating you easily match your customer's needs to the right size "rated" water heater.
- Performance Rating quickly makes you the water-heater expert; gives you quality and service to sell.
- Performance Rating means your customers won't run out of hot water
- Glass-lined or galvanized steel tank; 20 to 65 gallons; full price range.



American-Standard and Standard® are trademarks of American Radiator & Standard Sanitary Corporation

AMERICAN-Standard
PLUMBING AND HEATING DIVISION

IF YOU CUT LARGE DIAMETER PIPE...
YOU NEED THESE
New REED HINGED 4-WHEEL PIPE CUTTERS
Four sizes cover the range from 2½" to 12"

Users tell us these completely new cutters are so efficient they often "pay for themselves" through the savings in crew time on a half-dozen cuts. They are the first really practical tools for cutting off steel or cast iron pipe in sizes from 2½" to 12". You can, for example, cut 8" steel pipe completely off in less than five minutes.

Four wheel design requires minimum swing of handle—less digging in ditch work, easier "tight-corner" cuts.

Closed frame permits light weight with complete rigidity for better cutting.

4-point guide aligns the cutter on the pipe . . . assures perfect tracking and a right angle cut.

Reed Razor Blade wheels track perfectly, cut easily and roll down burr on steel pipe.

Unconditionally guaranteed to be the most efficient cutter you have ever used. Ask your jobber or write for literature.

REED MANUFACTURING COMPANY
ERIE, PENNSYLVANIA • U. S. A.

for **leakproof, pressure-tight connections**
use TiteSeal®
SEALING COMPOUNDS

Heat and vibration-proof, non-solvent, will not shrink, crack or crumble. Makes all assemblies leak-proof and pressure-tight. Prevents rust, corrosion, joint seizure.

7 BASIC BLENDS

LIQUID WRENCH®
The super-penetrating rust solvent

LOOSENS rusted bolts, nuts, screws, 'frozen' parts

Liquid Wrench works *fast*... yet is absolutely safe for all metals and alloys.

2171

At Industrial, Automotive, Hardware, Plumbing Jobbers

RADIATOR SPECIALTY CO.
Charlotte, North Carolina
SOLDER SEAL

NEW TRANSISTORIZED PIPE, VALVE AND CABLE LOCATOR

Contains many features never before found in a pipe locator:

- Single turn solid metal loops cast into the fiberglas case
- Switch on transmitter to allow for good and poor conductive ground
- Three-position sensitivity switch on receiver plus variable gain control
- Ten transistors—7 in receiver, 3 in transmitter

Plus these other deluxe features:

- Transmitter and receiver each operate on 4 flashlight batteries—average life 1400 hrs.
- Battery tester on receiver and transmitter
- Depth level indicator
- Adjustable drop handle
- Pulsed transmitter
- Will locate valves and pipes at greater depth and will trace pipes farther

MOST POWERFUL PORTABLE PIPE LOCATOR MADE TODAY!

Write for free literature

GARDINER ELECTRONICS CO.
Dept. 28
2545 E. Indian School Rd.
Phoenix, Arizona

Continued from page 108

Gas Co., Pittsburgh. With the company for 30 years, McWilliams has been industrial sales manager since 1953.

CHARLES ALDEN and G. KING KELLS have been promoted to branch manager posts at Neptune Meter Co. with dual responsibilities for Superior Meter Co. activities. From his headquarters in Portland, Oregon, Alden will be responsible for activities in the northwestern and western area of the U. S. — Washington, Oregon, Montana, Idaho, Wyoming, Colorado, New Mexico, Utah, Alaska, and part of California. Kells, as manager of the San Francisco-Bay area branch, headquartered in Millbrae, Calif., will be responsible for the counties of northern California.

GEORGE H. CROCK has been named works manager of the new Indiana (Pa.) division of Robertshaw-Fulton Controls Co. Crock became works manager of the company's Robertshaw Thermostat Division in 1954. He first joined that division in 1936.

KARL E. GORHAM has been promoted to superintendent of the southern production division of Ohio Fuel Gas Co., Columbus. With OFG since 1924, Gorham has been district foreman of the southern production division since 1956.

Karl Gorham
Ohio Fuel

W. E. McWilliams
Peoples Natural

G. H. Crock
Robertshaw

L. R. KIMMICH has been appointed to the newly created post of Phoenix commercial manager by Arizona Public Service Co. RAY WALKER succeeds Kimmich as Yuma division manager. Named to the newly created position of manager for gas operations in the metropolitan division is J. P. WATKINS.

E. ALFRED NELSON has joined Bucyrus-Erie Co., South Milwaukee, as market research manager.

PHILIP C. BEALS and FRANK L. HARRINGTON are newly elected directors of the Worcester (Mass.) Gas Light Co. Beals is executive vice president and treasurer of the Vellumoid Co. and Harrington is president of the Massachusetts Protective Association and of the Paul Revere Life Insurance Co.

JOHN M. MARVIN is manager of the new sales territory of the plastics division of Eastman Chemical Products, Inc. The new territory, headquartered in Greensboro, N. C., includes Virginia, North Carolina and parts of South Carolina, Tennessee and Kentucky.

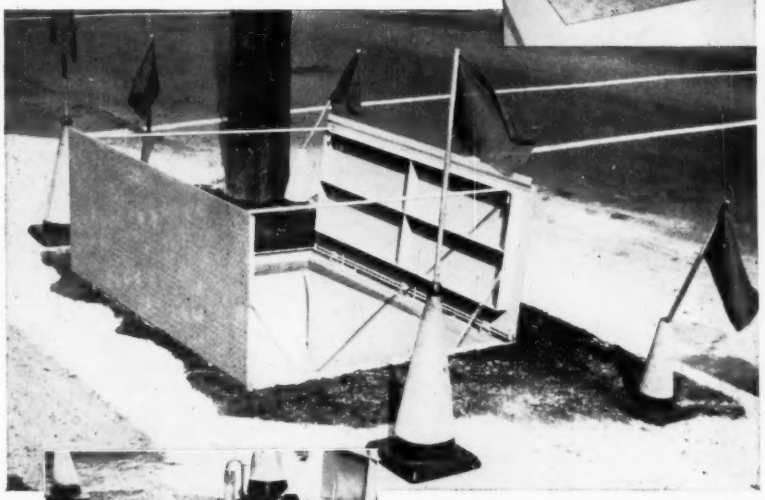
CHARLES M. DEVER, JR., has been appointed assistant manager of the Midwest district by Tube Turns Plastics, Inc., Louisville, Ky.

Northern Illinois has created a new division and made five key personnel appointments. Heading the newly created eastern division is DONALD B. MILLER. The division's headquarters will be in Blue Island until new facilities are completed in Glenwood. H. G. CARR, manager of the Bloomington area since 1955, was named manager of the southern division. He succeeded RAYMOND O. STAUSS, who was promoted to assistant to Charles F. Henness, recently elected vice president in charge of all Northern Illinois divisions. DONALD

Charles Alden
Neptune

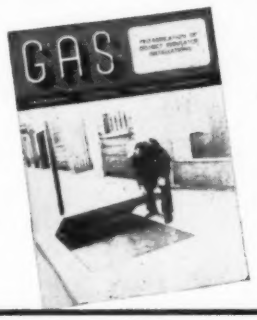
G. King Kells
Neptune

easiest access to regulators under-the-sidewalk



SPRING-BALANCED BILCO DOORS ARE EASY-TO-OPEN AND COMPLETELY WEATHERTIGHT

Bilco vault doors are the safe choice for gas regulator vaults underfoot. More and more gas companies are finding that Bilco doors wear better, keep water out. When opened they provide maximum ventilation for service men's safety. Built-in drainage and easy maintenance add up to another Bilco bonus—and every Bilco door swings open easily because it's *spring-balanced!*



Send coupon today for FREE copy of article in Gas Magazine, entitled: "Standardization and Prefabrication of District Regulator Installations."

Bilco®

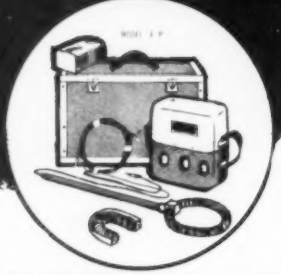
DOORS FOR SPECIAL SERVICES

The Bilco Company, Dept. A-194
New Haven 5, Conn.
Send reprint of article in Gas Magazine ( )
Send catalog with details of Bilco sidewalk doors ( )
Name_____
Firm_____
Address_____
City_____ Zone___ State_____

DESTINATION: TOMORROW!

TODAY THE E/4 SHOULDER HOLIDAY DETECTOR AND THE E/P PULSE TYPE DETECTOR FOR DAMP CLIMATES ARE ANSWERING THE PIPELINER'S NEED FOR A DEPENDABLE, FULLY PORTABLE, GENERAL PURPOSE ELECTRICAL INSPECTION INSTRUMENT.

BOTH MODELS CAN BE USED FOR A FULL DAY WITHOUT RECHARGING THE BATTERY. ALL WRAPPED SURFACES INCLUDING PIPE CAN BE QUICKLY AND ACCURATELY INSPECTED FOR VOIDS, PINHOLES, BREAKS, SCRATCHES AND BURNED OR COKED SPOTS...



TOMORROW THESE SAME DETECTORS WILL BE USED IN THE INSPECTION OF TUBING ON OUTER SPACE ROCKETS, FOR TINKER & RASOR DETECTORS ARE DESIGNED FOR THE FUTURE.

DISTRIBUTORS: Crutcher-Rolfs-Cummings Inc., Houston, Texas • Romco Manufacturing Co., Inc., Tulsa, Oklahoma • Canadian Equipment Sales & Service Ltd., Edmonton, Alberta, Canada • Bob Herrick, Rentals & Service, Harrisburg, Penna. • Falcon Line Products Corp., Elizabeth, N. J. • Export Agents . . . Frazer & Hansen Ltd., San Francisco, Calif.

Electronic Detectors for every Industry

TINKER & RASOR

417 AGOSTINO ROAD, P. O. BOX 281, SAN GABRIEL CALIFORNIA

Find it Faster with FISHER!

M-SCOPE PIPE FINDER

only $189.50

- Greatest depth penetration
- Greatest tracing distance
- Pinpoint accuracy
- One year between battery changes
- Built-in battery testers
- 90% less maintenance costs

Built for rugged field use; Transistorized circuits, compact fiberglass case.

SEND FOR FREE 1959 CATALOG

FISHER Research Lab., Inc.

Dept. G-3, Palo Alto, Calif.

Koenig ALL-STEEL SERVICE BODIES

FOR ALL 1/2-, 3/4-, and 1-TON TRUCKS

Each body electrically welded into one unit with bed reinforced. Sturdy and economical . . . weatherproof compartments with recessed paddle-handle door locks.

Write for literature on service bodies, line-construction bodies, side boxes, and King Winches.

KING WINCHES

A-11 King Winch on A-120 (4 x 4) International truck. There's a front-mount King Winch designed to fit your specific needs . . . for ½-ton through 2½-ton trucks . . . pulling capacities of 8,000 to 19,000 lbs.

P.T.O.-driven King Winch on Willys Jeep FOR ALL WILLYS JEEPS, 4 WD TRUCKS AND 4 WD STATION WAGONS. Power-take-off-driven King Winch models 130J and 131J for CJ-3B and older-model Jeeps, can be transferred to CJ-5 and CJ-6 Jeeps . . . nothing extra needed.

King Winches for International trucks available through International dealers.

Koenig cabs and King Winches for Willys vehicles available through all Willys dealers.

Koenig IRON WORKS, INC.

P. O. BOX 7726 HOUSTON 7, TEXAS

F. DAVIS became manager of the Bloomington district. FRANK MURRAY, industrial engineer, succeeds Davis as Joliet district superintendent.

WILLARD F. ROCKWELL JR., president of Rockwell Manufacturing Co., is heading a heavy machinery industry committee for fund raising on behalf of the largest campaign of citizen education in foreign policy ever undertaken by private auspices in this country. The non-partisan Foreign Policy Association marked its 40th anniversary with its first national appeal for funds . . . R. E. ZIND has been named treasurer of Hills-McCanna Co., Chicago . . . JOEL HUNTER, president of Crucible Steel Co. of America, has been named to the board of directors of Allis-Chalmers Manufacturing Co., Milwaukee. BEAUCHAMP E. SMITH, general manager, hydraulic division, Allis-Chalmers York (Pa) Works, has been elected a vice president.

Deaths

GEORGE H. CLIFFORD, 77, an executive of Stone & Webster until his retirement in 1956, died recently in San Barbara, Calif. He had served for 55 years as an executive in the utility industry. A recognized authority on utility organization, financing, and management, Mr. Clifford as a Stone & Webster executive, played an important part in achieving the extension of gas pipelines from Texas to the East coast.

ELLIS L. PHILLIPS, former president and chairman of the board of Long Island Lighting Co. died recently in New York. He was 85. Mr. Phillips was LILCO's first general manager and became its president in 1911. He served as president until 1937 then became chairman of the board and remained so until January 1945.

FREDERICK J. SCHAFER, retired Southern California Gas Co. executive, died recently in Los Angeles at the age of 87. Mr. Schafer started with Los Angeles Lighting Co. in 1895. When SoCal was formed in 1908, he was named assistant superintendent of gas distribution and generation, and designed and supervised construction of its first office. In 1930 Mr. Schafer became vice president in charge of manufacture and distribution. He retired in 1937.

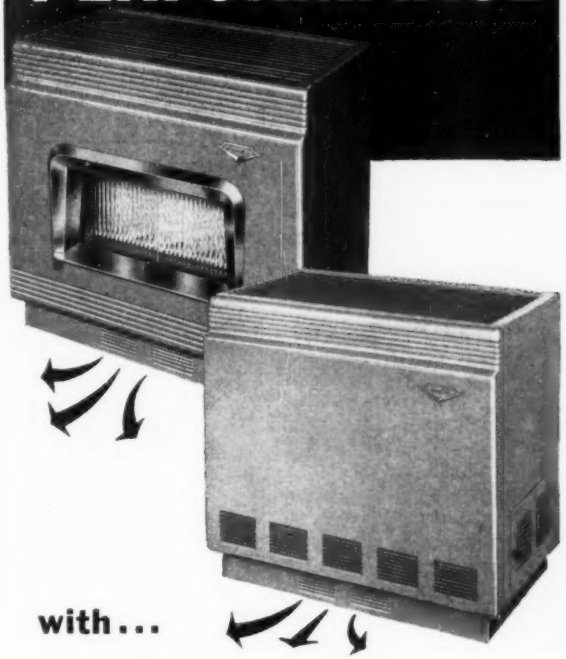
Chilton
PUBLICATIONS

Foremost IN THE FIELDS THEY SERVE

CALL A CHILTON MAN

CHILTON COMPANY
56th & Chestnut Streets
Philadelphia 39, Pa.
Sherwood 8-2000

PERFORMANCE



with...

Peerless® GAS CONSOLE HEATERS with Counter Flow Heat (Optional)

Peerless performance means *profits* to you. Because a Peerless puts out heat — lots of heat where it's needed and does it economically.

We recommend the Peerless with Counter Flow Blower Attachment for those really tough jobs where gravity circulation of heat is not adequate. In fact, the boost given in warm air circulation is ample for heating several rooms. Peerless Counter Flow equipment is available for all 50,000 and 65,000 BTU heaters, either radiant or closed front, and is delivered complete with its own temperature *controls* and six feet of electric cord. It can be bought with the new heater or installed later.

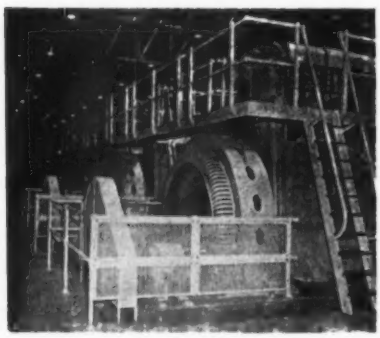
There is a *complete* line of expertly-engineered Peerless gas console heaters—closed front models from 20,000 to 65,000 BTU input. *All* models are A.G.A. approved for natural, mixed, manufactured and L.P. gases. And, all include the traditional Peerless quality and smart, contemporary design that has made Peerless the *preferred* model by both dealer and consumer!

Look for us at the Conrad Hilton, Space 176-177 at the LPGA Show in Chicago May 3-6.

GAS Peerless | *The modern fuel* THE MODERN HEATER

PEERLESS MANUFACTURING DIVISION
OF DOVER CORPORATION
LOUISVILLE 10, KENTUCKY

WARRENGAS
the Concentrated Fuel
GULF GULFTANE LP-GAS
WARREN
PETROLEUM CORPORATION
LIQUEFIED PETROLEUM GAS DIVISION
TULSA, OKLAHOMA
SALES OFFICES:
FORT WORTH, TEXAS
HOUSTON, TEXAS
LOUISVILLE, KENTUCKY
MIDLAND, TEXAS
JACKSON, MISSISSIPPI
ST. LOUIS, MISSOURI
NEW YORK, NEW YORK
OMAHA, NEBRASKA
COLUMBIA, SOUTH CAROLINA
TAMPA, FLORIDA
LOS ANGELES, CALIFORNIA
BRYN MAWR, PENNSYLVANIA



13,750 KVA POWER PLANT. *Still Installed.* Will be sold as complete unit or piece by piece. Consists of (11) 1250 KVA Rathbun-Jones Natural Gas Generator Sets. **ENGINES**—1430 HP, 8 Cylinder, 4 Cycle, 300 RPM, direct connected to **GENERATORS**—1250 KVA, .8 PF, 3/60/2400-4160. Complete with Switchgear. Can be seen in operation on foundations. **PRINTS** and Photos available. Write **HEAT & POWER CO., INC., POWER EQUIPMENT DIVISION,** 60 E. 42nd St., New York 17, N. Y. Also 310 Thompson Bldg., Tulsa 3, Okla.

GAS Pipeline People

Two new vice presidents and a treasurer have been elected by Colorado Interstate Gas Co., Colorado Springs. PETER J. KING JR. is vice president for corporate and financial matters while THOMAS L. PELICAN is vice president for engineering. JOHN J. YEONOPOLUS is treasurer, replacing WILLIAM B. KICE who retired at the end of 1958. King has been with CIG since 1953, serving as administrative assistant to president W. E. Mueller. Pelican, with CIG since 1948, has been in charge of the company's industrial engineering department since 1953. Yeonopolus, who joined CIG in 1941, has been director of rates and budget since January 1957.

Peter King
Interstate

Thomas Pelican
Interstate

J. J. Yeonopolus
Interstate

W. F. Krueger
Dresser

A new department for the sale of gas and oil transmission pipeline products has been established by Dresser Manufacturing Division, Dresser Industries Inc., Bradford, Pa. Manager of the new department is W. F. KRUEGER. With Dresser since 1956, Krueger has been closely associated with the research and product development program for transmission lines since its inception.

Three new directors have been named by Tennessee Gas Transmission Co., Houston. They are: HAROLD BURROW, who is executive vice president of the company; CHARLES W. HAMILTON, senior vice president and trust officer of the National Bank of Commerce; and H. MALCOLM LOVETT, senior member of the law firm of Baker, Botts, Andrews and Shepherd. A. DEE

(*Continued on page* 158

Faster LOCATING!
LOWER SERVICE COSTS!
with the improved AQUA VALVE BOX LOCATOR!

STOCK this useful tool for every service CAR and CALL • Speed Locating • Keep Customers Happy

- NO WIRES, BATTERIES or SWITCHES—simple, powerful magnetic action, factory adjusted to YOUR geographical location assures unfailing results!
- NO NEEDLE SPINNING—exclusive electric braking action saves you time!
- NO STOOPING—easy top-view reading!
- RUGGED—compact, accurate, convenient!
- GUARANTEED—to function regardless of weather, surface or ground cover!
- NATION'S MOST WIDELY USED LOCATOR!
- 15-DAY FREE TRIAL—No money! No obligation! You be the judge!

ORDER NOW-Wire or Call Kirby 1-4200 collect
AQUA SURVEY & INSTRUMENT CO.
2016 Leslie Ave., Cincinnati 12, Ohio

OPPORTUNITY FOR SALES ENGINEER

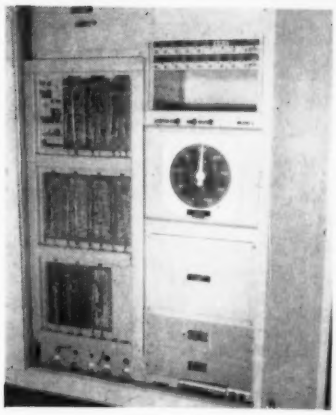
Man with experience in gas or water distribution network analysis wanted to sell the McIlroy Fluid Network Analyzer to gas and water utilities. Applicant must have basic knowledge of electricity. Position offers opportunity to travel extensively throughout the United States and Canada. Salary arranged. Submit photo and complete resume with education, experience and references. **Write to S. C. Jordan, Sales Manager, The Standard Electric Time Company, 89 Logan Street, Springfield, Massachusetts.**

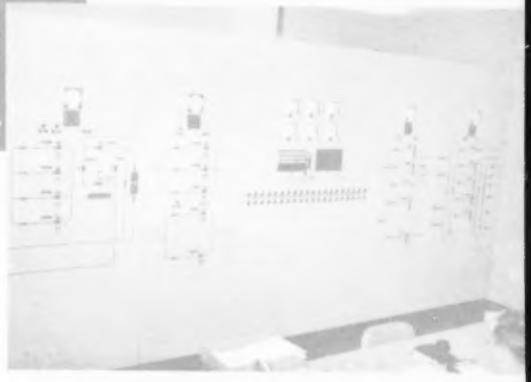
The R. W. STAFFORD CO.
GAS CONSULTANTS—ENGINEERS—CONSTRUCTORS
Natural Gas Conversions
Plant Management and Operation
Peak Shaving and Standby Plants
Accident and Insurance Investigations
EVANSTON, ILLINOIS
2944 Grant St. — Phone UNiversity 4-6190

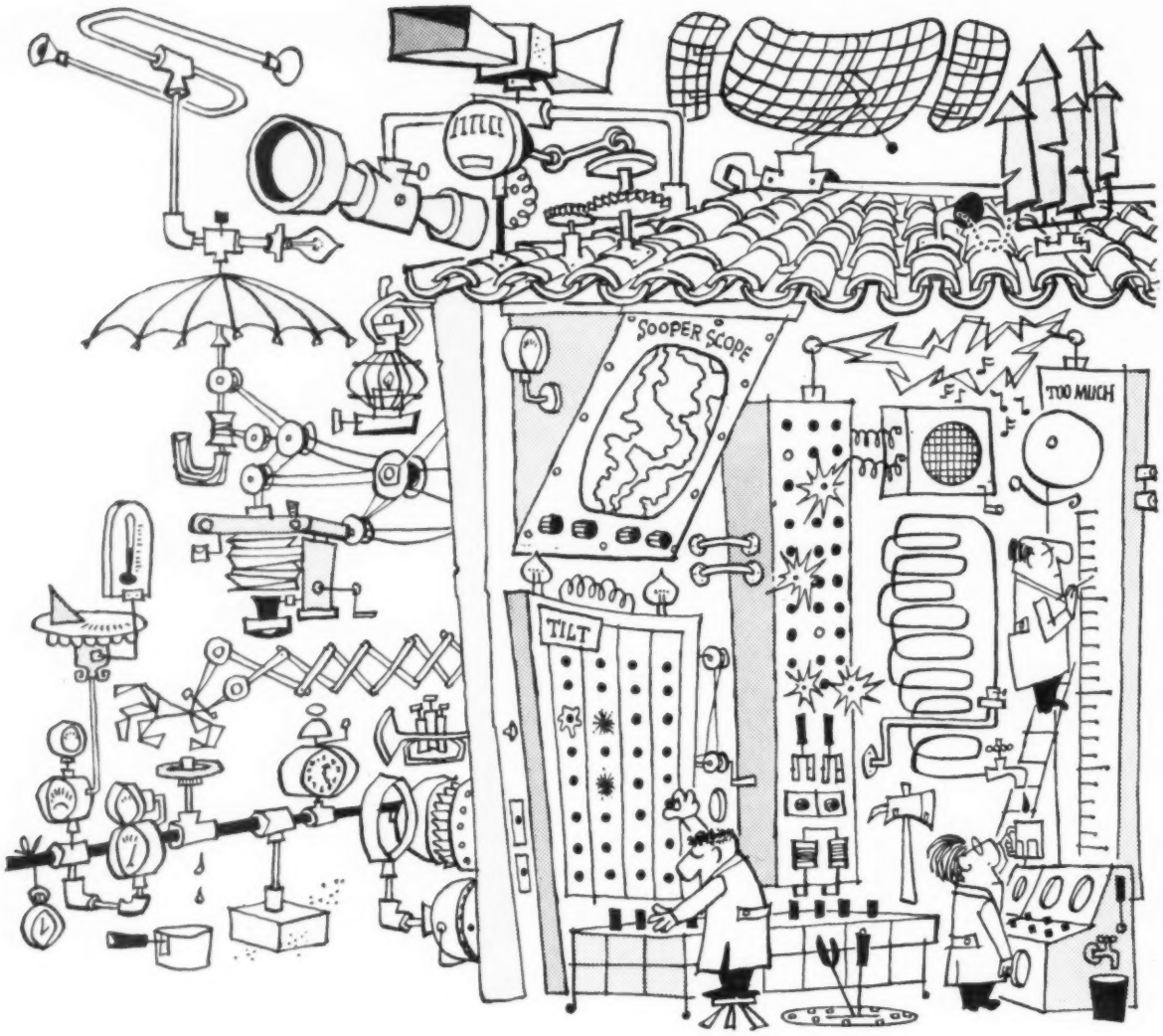
GAS

PIPELINE SECTION

A step toward automation







How much control does your pipeline need?

If you have some imagination, like our artist, you can go hog-wild in working out a pipeline control system. If you really wanted it, Union Switch & Signal could even give you a digital read-out of your mother-in-law's blood pressure a thousand miles away.

But clean engineering requires just the right amount of control. We've learned, after 78 years of hard knocks in the control business, that overdesign is just as bad as underdesign. We all strive for positive, reliable, informative, labor-saving control. No more. No less.

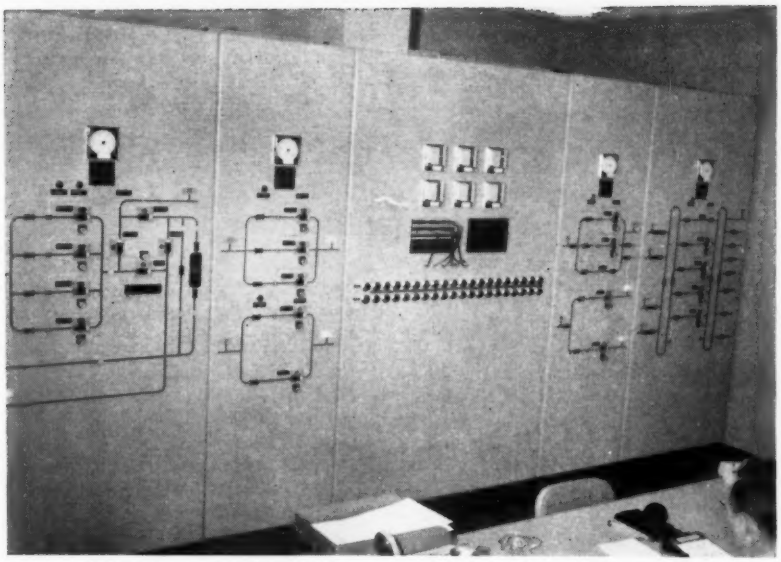
Union Centralized Transport Control can remotely operate a single booster station or an entire system. It can provide automatic sequencing, telemetering, data handling and display, data logging, instrumentation and communications.

Union CTC will lower your operating costs, and it is completely error-free. It's a new concept in pipeline control. Write to us so we can tell you about it.

See us at: PESA—Galveston, April 7-9. Booth 18-20-22 • IPE—Tulsa, May 14-23. Sec. R-Oklahoma Drive

"Pioneers in Push-Button Science"

UNION SWITCH & SIGNAL
DIVISION OF WESTINGHOUSE AIR BRAKE COMPANY
PITTSBURGH 18, PENNSYLVANIA



Step toward automation

By KENNETH C. YOST
Hope Natural Gas Co., Clarksburg, W. Va.

THROUGH the ages man has eternally searched for an easier and more practical method to accomplish his work. The system that we will endeavor to discuss in this article is a method by which men at a central location may perform the functions that were required of other individuals many miles away at different locations. The system is not the ultimate; no, the surface of the possibilities for the use of this type of equipment in the gas industry has only been scratched—therefore, just a step, but a big one, toward automation.

The first question that we may ask ourselves is: "What is the purpose of an information system in the gas industry?" To answer this question, let us examine briefly the problem of dispatching natural gas in the Hope Natural Gas Co. system. The dispatcher is the nerve center of the transmission system, just as the brain, in a similar manner, is the nerve center of the human body. The gas dispatcher controls the supply of natural gas which is fed into the system, prorates the supply into the various pipeline arteries, allocates the required amount to various cities and other gas utilities as the need arises, and either makes up the deficit or stores the surplus from production and purchases in underground storage facilities. To perform this task, it is essential that the gas dispatcher have detailed information and the means to utilize this information. The information required is, essentially, how much and where. That is to say, how much gas is flowing in various lines in the system? What is the pressure in these lines? This information is given to the dispatcher hourly by trained personnel who will also observe any radical variation in these measurements and notify the dispatcher as soon as the variation is noted; they will also operate any valves that the gas dispatcher deems necessary in performing his duties to insure an adequate and reliable supply of natural gas to the customers.

To free men from the routine task of observing and reporting pressures and volumes and operating valves, the information system must be able to perform these functions. The system, therefore, performs the same functions previously accomplished by personnel at the remote stations.

The value of an installation of this type may be expressed in many ways—such as, man hours re-

Fig. 1 (Above). Graphic panel in dispatcher's office in Clarksburg. Left to right: Dry Fork, Brown's Run and New York State, Patch panel with trend recorders and hi-lot set pots, Round Bottom, and Clarington.

Fig. 2. Panalog 605 information system.

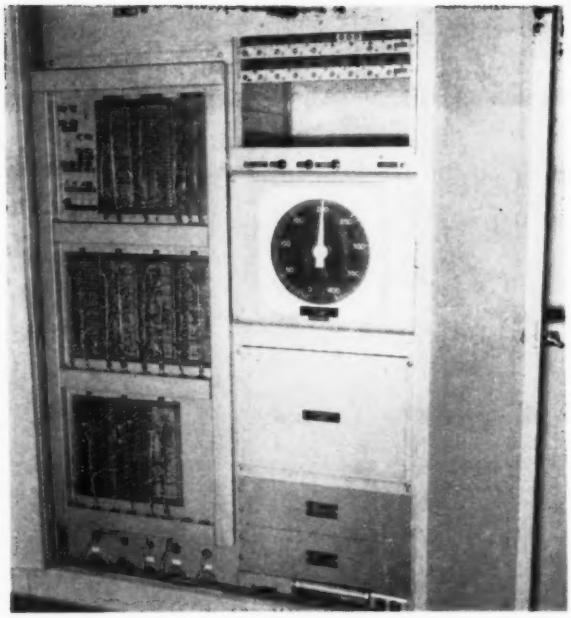


Fig. 3. Underwood automatic typewriter.

placed, favorable public relations, value of gas lost due to line rupture and economics of gas dispatching. Public relations, gas losses and economics of dispatching are difficult to substantiate on a monetary basis due to the variables involved in each individual company's transmission system. Probably the most basic cost analysis of an installation of this nature may be expressed in terms of the wages of personnel released for other and more purposeful duties.

Information from all major points in the transmission system is essential for efficient and economical gas dispatching; this information should be at the dispatcher's disposal at all times. This would substantiate additional logging facilities for key positions in a transmission and distribution system. Due to delegation of responsibility, it is more convenient for distribution information to be provided at the individual city plant office, but transmission information should be provided at the central dispatching office. With the accumulation of information of this nature, the gas dispatcher is in the unique position of being at several places at one time. He may diagnose the problem and be well on the way to repairs before information of the problem is received at the control center by other means of communication.

Data logging becomes an essential feature in the system as the amount of information delivered to the control center increases. The automatic typewriter will log the information which will free the dispatcher to devote his entire attention to the efficient distribution of gas.

- **Graphic panels**

The graphic panels (*Fig. 1*) in the dispatcher's office, at Clarksburg, give a general indication of the station piping at the various locations. The first panel is a graphic representation of Dry Fork measuring station (primarily a storage measuring station) consisting of four 10-in. orifice tubes and facilities for converting from storage input to storage output. The second panel is a graphic representation of two measuring stations—Brown's Run (top) and New York State (bottom). The third panel houses six trend recording receivers which may be used on any of the functions which are telemetered into the dispatcher's office; this is accomplished by plugging the proper receiver jack cord into the desired function's jack. The jacks are located directly below the trend recording receivers. The two rows of potentiometers, located directly below the trend recording jacks, are devices calibrated in pounds per square inch which may be set by the operator to indicate high and low pressure limits or a given operating range for all of the pressure locations being supervised by the equipment. The top row is for high pressure limit settings and the bottom is for low pressure limit settings. Any variation above or below this range will give an audible and visible alarm to the operator.

The fourth panel is a graphic representation of Round Bottom measuring station and the last is Clarington measuring station.

The indicating receivers at the top of each panel, through the use of the select switch located directly below them, may be used for instantaneous readings

of any function from this particular station. Each receiver dial has a scale calibrated in millions of cubic feet per day for the flow in the individual orifice tubes and a scale calibrated in per cent which may be used for the desired pressures at that station.

To perform a flow change at the remote station, the operator must first select the proper orifice tube with the select switch. The present flow and any change that the operator makes will be indicated on the indicating receivers. The push buttons below the valve symbols must be positioned into the raise or lower position and depressed until the desired flow condition is reached.

Two lights (blue and white), located on each valve symbol, will indicate the position of the downstream plug valve on the orifice tube. The blue light indicates that the valve is closed and the white that the valve is open; both lights will burn if the valve stops in an intermediate position. An additional light (red) in the top of the symbol indicates the tube which is selected for a control operation.

Indicating lights on the graphic panels of each transmission line entering and leaving the measuring station will light when the pressure reaches the preselected alarm point. This point must be set on the hi-lo set potentiometers on the center panel. There are also small lights on the jack panel to assist the operator if he desires a trend of the pressure variation when a function goes into alarm.

Fig. 4. Single pair telephone lines.

Fig. 5. Lenkurt tone rack (right) and Westinghouse Visicode (left) in tone building at Dry Fork. The top group of relays is for pulsing signals. The auxiliary relays (top row) raise controllers 1-4 respectively; second row lowers 1-4; third row opens crossover valves; fourth row closes crossover valves. Top module of Lenkurt rack is line filter; next four are dual frequency transmitters and jack panel for test purposes. One dual receiver is located between these transmitters and the carrier transmitter-receiver is on the bottom.

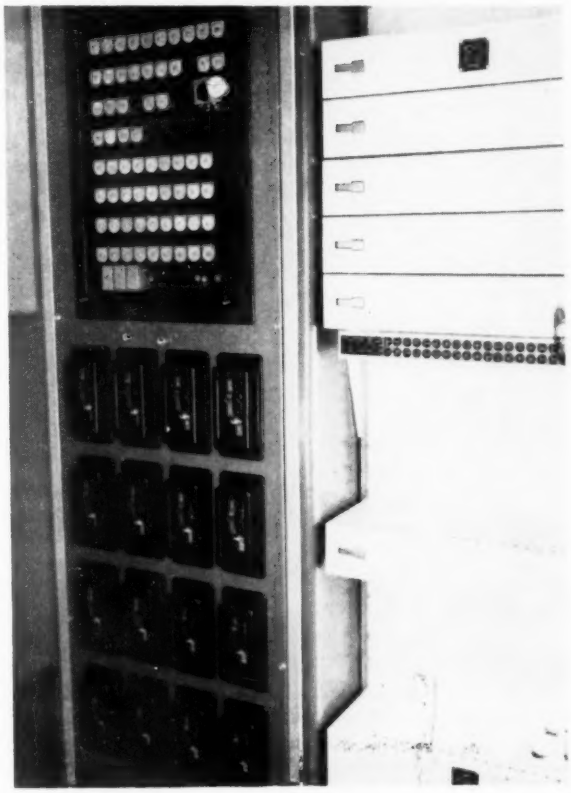
- **Function logging**

Three main units are required in the control center for function logging: telemetering receiver units; analog to digital conversion unit; automatic typewriter.

- **Telemetering receiver units**

The telemetering receivers used for logging purposes are basic Bristol receivers with the addition of a unit (circular slide wire) for converting the reading into an electrical analog. These receivers are not shown but they are located on panels back of the graphic panels (*Fig. 1*) which provide free standing panel sections bolted together. The front and back panels are 2 ft, 6 in. apart, which provides adequate space for inter-panel wiring and necessary equipment maintenance.

The retransmitting slide wire used in the receivers is a 1000-ohm wire with the slide wire brush positioned by a direct drive gear from the telemetering receiver movement. End resistances are added which will



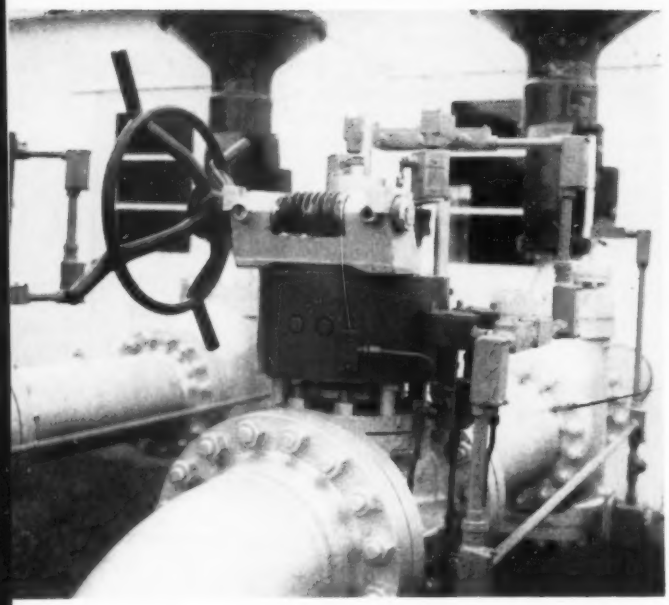


Fig. 6 (left). Shafer plug valve operator. Three-way solenoid valves for opening and closing are on side of operator. Limit switches are on top of operator. It may be operated manually by inverting key and shutting off gas supply to operator. Control valve is shown in background.

Fig. 7 (above). Clarington measuring station. Tone equipment is in office. Control building is between office and meter house.

change the range of the various wires in accordance with the required maximum digital value of the received function. The unit is designed in such a manner that a 2.5-mv voltage drop is required for each digit to be printed on the log sheet. The supply voltage to these wires is a regulated 5 v which would provide a maximum reading of $\frac{5}{2.5} \times 10^3$ or 2000 digits; therefore, maximum readings of less than 2000 digits require that the additional voltage be dropped through the end resistors.

Calibration of the retransmitting slide wire receiver is performed by using the Bristol impluse timer unit calibrating the indicating scale on the front of the recever in accordance with standard procedure. The slide wire is calibrated at two points, 10 per cent (zero adjust) and 80 per cent (span adjust), through the measuring element, which are the only points required for complete calibration of the wire. The adjustments of the slide wire, span and zero adjustment, are provided by two variable resistors in the end resistor sections. The linearity of the slide wires is very good, with a maximum observed deviation of 7 digits on a 1500-digit scale. It might be noted at this point that better linearity of wires may be achieved if this degree of accuracy is necessary for a particular operation.

There are several methods which may be used in applying the variables to the orifice tube coefficient, but Hope chose to use what may be termed a standard coefficient. This is possible due to the slight variation in these variables and the fact that a small error in readings may be tolerated in most instances. The received signal from the field for flow quantities is equal to the square root of the product of the pressure and differential across the orifice plate. Therefore, with a standard coefficient, the flow through the orifice tube may be determined as a percentage of the maximum flow conditions. A manual adjustment of the maximum flow value for any change in coefficient could be made by changing the value of the end resistance of any particular retransmitting slide wire. The application of the unit will, of course, determine how essential it is that the coefficient be changed with operating conditions.

- **Conversion unit**

The analog-to-digital conversion section as the name implies is essentially a unit to convert the retransmitting slide wire value to a digit; this is performed, along with other functions, by the Panalog 605 information system (*Fig. 2*). Each analog from the retransmitting slide wire is measured by the self-balancing bridge instrument (pictured in the center right of *Fig. 2*). A Coleman digitizer will then convert this balance point to a digital value which will be recognized by the automatic typewriter.

The information going to the anolog-to-digital conversion section must be fed into it in a proper sequence to insure that the correct point has been selected for measurement; this is accomplished through the use of the selector section (not pictured). The selector section is composed of two automatic electric Type 45 rotary stepping switches containing 12 levels of 25 points each. An electrical impulse to the solenoid of the stepper switch cocks a pawl on a pawl and ratchet system. When the pulse is eliminated, the solenoid is de-energized and the ratchet will move the selector (stepping switch) one point. The pulse is initiated by the programming system, during logging cycles, to indicate that one point has been measured and stored and the measuring system is ready for the next point. During scanning for off-normal functions, the pulse generator will step the selector switch at the rate of one point per second. This rate of scanning may be increased if desired depending upon the urgency of the information.

The signal level of the input selector wipers is connected to the measurement instrument through compensation networks. These compensation networks are essential to provide the proper range correction to the slide wire of the measuring instrument. The stepper switch has another level which selects the normal operating range for any particular variable to prevent unnecessary hunting of the measuring instrument. The unbalanced voltage between the retransmitting slide wire receiver and the compensated slide wire is amplified through a suitable method and drives the balance motor of the measuring element which in turn drives the slide wire wiper until the net input to the amplifier is balanced at zero.

The null balance detector circuit, which is also connected to this amplifier, will initiate the Coleman digitizer (analog-to-digital converter) at the instant that the unbalanced voltage goes to zero. The digitizer consists of three contact and commutator brush subassemblies with the brushes directly coupled to the balance motor and driven in a direction and through an angular distance determined by this motor. Upon achieving balance, the brushes are permitted to come in contact with the commutators which energize the proper digital relays. The digital relays remain energized until the print programmer requires the digits to be printed, one at a time, in their proper sequence and position on the log chart.

During the scan cycle of one point per second, the information system will compare the readings of the retransmitting slide wire receivers and the hi-lo set pots for any pressures which have varied from the desired readings. When a point of this nature is detected, the unit will give an audible alarm and immediately log the point identification, time and value of the pressure in the off-normal section of the log charts in red. At this time the pressure alarm lights (previously discussed in conjunction with the graphic panels) will also indicate the pressure which is off-normal on the graphic panel. The pressure which is in alarm will also be printed in red in the normal section of the log chart until such time as the pressure at that station returns to normal or another operating limit is selected on the hi-lo potentiometers. When the point in alarm returns to normal, the point identification, time and pressure will again be logged in the off-normal section of the log chart, but in black rather than red.

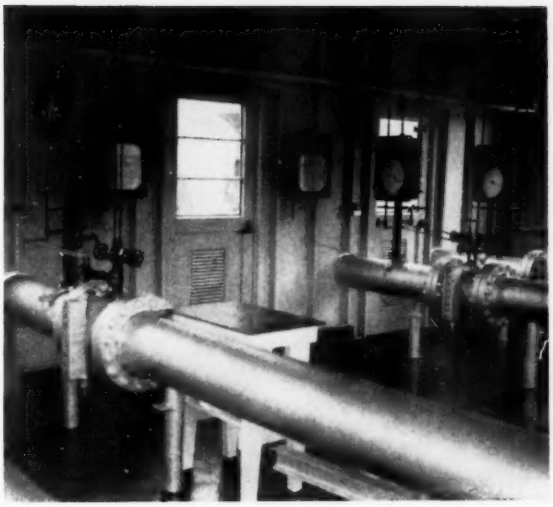


Fig. 9. Meter house.

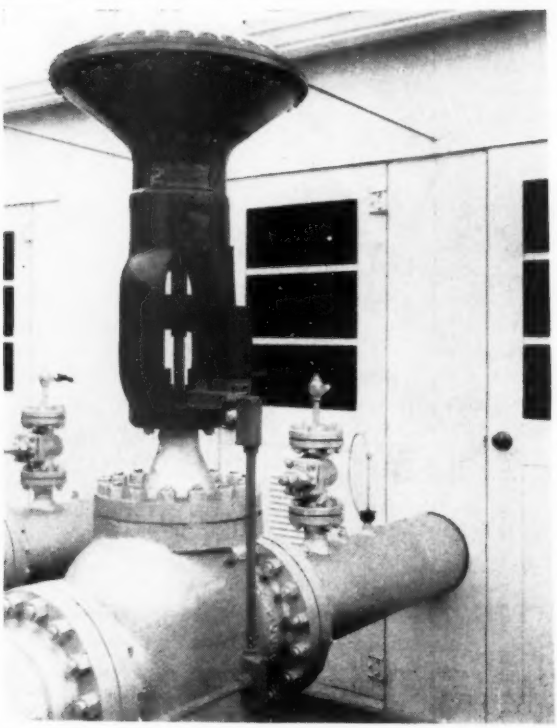


Fig. 8. Control valve—Fisher 57T with KK topworks and single pole-double throw limit switch mounted on yoke.

- **Automatic typewriter**

The typewriter (*Fig. 3*) is essentially an electric typewriter with the exception that solenoids operate the keys rather than an operator. The carriage remains in the off-normal position until such time as the unit is called upon to log functions. At this time the carriage drives to the right and engages in a drive mechanism (mechanical chart programmer) which positions the chart for a normal log. The data supplied by the information system will then be printed in sections across this sheet which have been assigned to these particular functions. Upon completion of the log the carriage will again engage in the drive mechanism and return to the off-normal section of the log chart.

The small console at the left of the typewriter is provided for operator control of the unit. Although the normal log sequence is such that a log is initiated each hour, the operator may initiate a log by pressing the log initiate button on this console at any time he desires. Other functions of the console are: an off-normal summary initiate, which will summarize all off-normal information stored in the unit; chart remove and chart start buttons, used in changing log

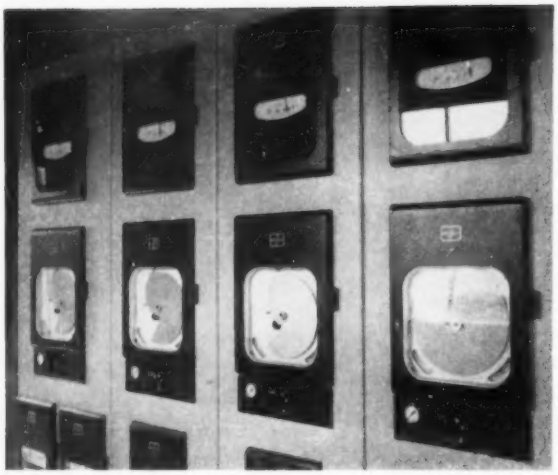


Fig. 10. Typical control panel with pressure compensated flow transmitters on top and remote set flow controllers and pressure transmitters on bottom.

charts; and four lights to indicate operation failure, log, test and scan which inform the operator of the status of the unit.

- **Communications**

It would not be feasible to use metallic pairs of transmission lines to transmit each function to the various stations due to the complexity and number of lines which are required for a system of this nature. Another, more practical method must be used; therefore, microwave, tone transmission or a selection type system seem to be the most desirable methods.

Microwave transmission would require many retransmitting towers in the rugged West Virginia terrain which would make this impractical for the Hope system. This type of transmission is very good in the plain states, especially if telephone lines do not exist to provide contact with the measuring stations which are to be controlled.

The selection type of system has been used effectively by many companies where continuous information from all functions has not been required.

The tone transmission system has been selected for use in Hope's system for many reasons which make this type of communications more practical and more feasible due to existing operating equipment and requirements of the control system equipment.

The first requirement is that the operator must be able to observe the changes being made in the field while performing the function. Also, it is not desirable to eliminate the scanning functions for off-normal conditions at any time. Therefore, the information from all field functions must be available for the operator at all times.

Another consideration is that existing telephone lines to these stations can be used with tone-type transmission. This eliminates tower construction for microwave and uses facilities already available at a minimum of additional cost. These lines may be still used for voice communications through filtering arrangements and the number of functions which may be transmitted in addition are only limited by the design characteristics of the lines and the carrier equipment.

Lenkurt tone equipment was chosen for this installation to provide additional function channels. This is accomplished with carrier channels which are modulated by individual audio tone transmitters. The control equipment channels had to be such that loss of tone due to line equipment, or power failures would not accidentally operate the field equipment; therefore, the equipment must fail safe. To accomplish this, a definite tone must be received at the remote station before a function will be performed. An additional safety feature was used in that two tones must be transmitted to close any valves, which lessens the possibility of noise or other stray signals operating the equipment to close valves and putting the customer out of gas.

Lightning noise will cause this tone equipment to operate and in many instances, direct-operated plug valves have been closed due to this operation. The direct-operated plug valves (opened or closed from Clarksburg) operate in approximately two to three seconds which, if not compensated for, would permit lightning to open or close the valves. This condition was eliminated by the use of a condenser in the tone receiver which delays the operation of the equipment. Hope found that a five-second time delay was adequate to prevent valve operation by lightning with instantaneous recovery (reset) when the tone was eliminated. This problem is not severe where control valves are used due to the time of application required before the control point changes appreciably.

To facilitate the use of existing telephone circuits, the system was routed as indicated in *Fig. 4*. All equipment northwest of Clarksburg was routed through Hastings station. At this point, the voice channel was fed through the switchboard to facilitate routing of calls to the various stations. The carrier equipment (1st, 2nd and 3rd story) was routed to the proper stations through filters at this location. One pair of lines is all that is required from Clarksburg to Hastings and from Hastings to the various field stations as indicated in *Fig. 4*.

Fig. 5 is a picture of the communications installation at Dry Fork measuring station where Westinghouse Visicode is used for control and supervision over two tone channels of the Lenkurt tone; the additional tones are used for telemetering flows and pressures from this station.

- **Field installations**

The field measuring stations are designed according to AGA metering specifications. The control valves and positive shut-off valves are located on the downstream side of the stations as pictured in *Fig. 6*.

The operation of the control valve and downstream plug valve is such that at any time the control valve is off the seat, the downstream plug valve is opened by the Shafer operator. This means that the plug valve is open and will remain open through the travel of the control valve until such time that the control valve closes and then the plug valve will be auto-

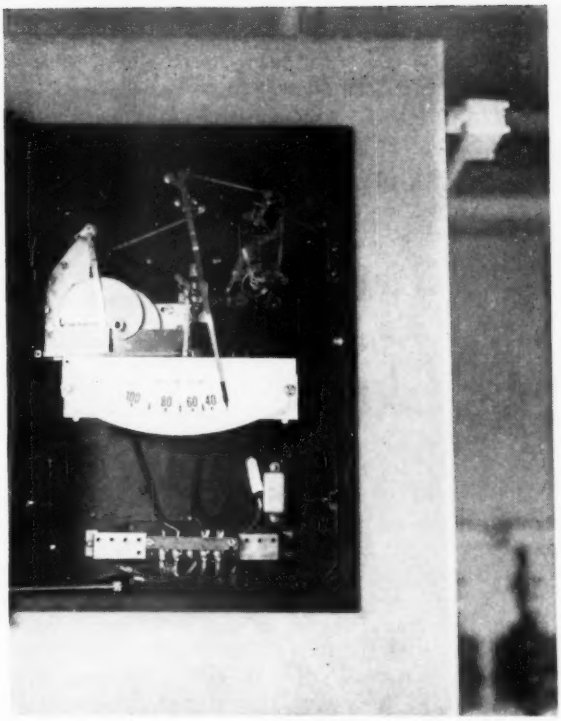


Fig. 11. Pressure compensated flow transmitter.

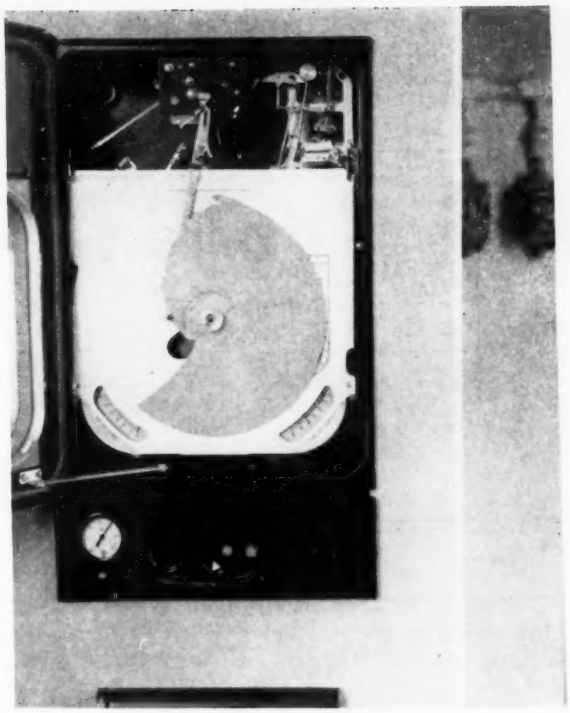


Fig. 12. Pressure compensated remote set flow controller.

matically closed. An arm (*Fig. 8*), attached to the control valve stem will operate a limit switch which, in turn, will energize the proper solenoid valve on the Shafer operator to open or close the plug valve.

Fig. 7 is a picture of the general layout which is used at all of the remote control measuring stations. Three buildings are required at all stations; meter building; control building and office.

The meter building houses the orifice meters and recording thermometers, with space and facilities for rolling the orifice tubes out for inspection and cleaning. Junior orifice fittings are used with gauge lines to the orifice meters and also to the control building for the controllers and flow transmitters (*Fig. 9*). All gauge lines to the control building and from the control building to the control valves are located in the overhead channel to facilitate ease of access.

The control building houses the control panel (*Fig. 10*), instrument gas supply regulators and recording gravitometer for this station. The flow transmitters (*Fig. 11*) are Bristol pressure-compensated units with a square root cam. The unit is calibrated so that the information telemetered is a percentage of the maximum extension ($\sqrt{Ph}$) of the individual orifice tube.

The pressure-compensated remote set flow controller (*Fig. 12*) is identical to the standard flow controller with the exception that the set point (control point) is determined by the position of the cam follower on the metal cam as pictured. This cam is driven by a reversible electric motor which is energized through relays either in the Visicode (Dry Fork station) or Lenkurt tone at all other stations. The unit is direct-acting, requiring pressure to close the control valve; this is done to insure that the gas supply to the customer will not be lost if the instrument's supply gas or diaphragm on the control valve should fail.

The office building houses the necessary tone equipment and stand-by power unit out of the hazardous area. The stand-by power unit is a 5 KVA plant which would pick up the station load in the event that the purchased power supply to the station would fail.

• Conclusions

The system must accomplish safely the same functions that personnel would perform at a measuring station. Safe functioning has been accomplished to the extent that nonintentional equipment operation is highly improbable. Loss of telephone lines, power failure or equipment failure will not cause involuntary operation of the equipment. The telemetering of information will, of course, be lost, but the flow will remain in the last operated position until repairs have been completed. Loss of supply gas to the controllers or diaphragm rupture on control valves will result in the valves failing open.

The necessary information may be presented to the dispatcher in such a manner as to increase the efficiency of operation of the gas transmission system. This means of controlling the flow of gas is also provided to insure rapid and accurate allocation of gas through the transmission system. ■

Evolution of the

Vortex-velocity gas meter

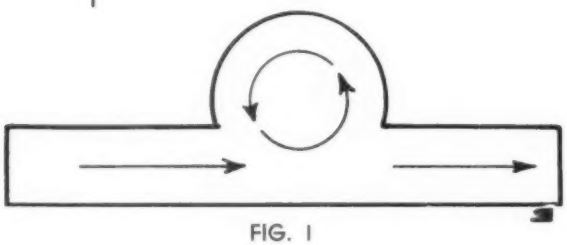


FIG. 1

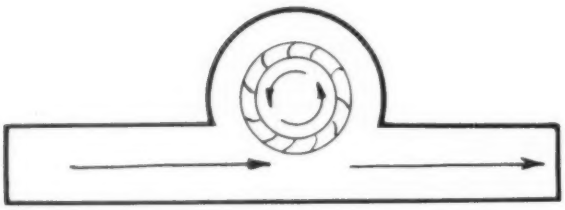


FIG. 2

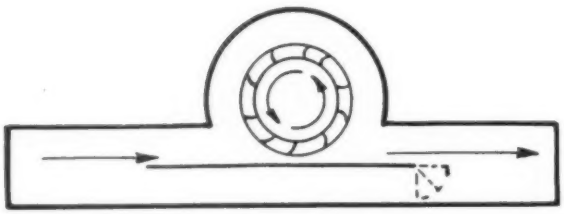


FIG. 3

METERING is an old story in the gas industry in contrast to the measurement of other petroleum products. Recent experiments in automatic custody transfer bear witness to the development in the liquid metering field. The progress in liquid metering has been paced by a re-examination of established gas measuring technique.

Many methods have been employed to measure gas, most of which have received recognition at one time or another. The most common have been the venturi tube, flow nozzle, pitot tube, rotary-type positive displacement meter, diaphragm-type positive displacement meter and the orifice meter. The latter two have been most used and accepted.

The success of the diaphragm meter is demonstrated by the millions to be found about the premises of American homes. This meter has been found irreplaceable because of its ability to accurately measure pilot loads. While it is primarily employed to measure small volumes of gas to domestic consumers, it is often used to measure larger and reasonably sustained rates of flow. However, this application of the diaphragm-type displacement meter leaves room for argument for economic reasons. Normally, large volumes of gas, especially under high pressure, may be more economically measured with the orifice meter.

Orifice meters have gained acceptance for measuring large volumes at high pressures through vigorous and sustained action of the American Gas Association since the 1920's. Those buying and selling gas, in concert with the various trade associations and governmental bureaus, have consistently worked to improve orifice metering designs and refine the metering equation. Also, the quest for added orifice metering accuracy has been given impetus by the continuing advances in the commodity prices of gaseous fuels.

Through experimentation and development, orifice metering evolved to a point where the AGA gas measurement committee had cause to recommend a lengthy flow equation in its Report No. 3 of 1955:

$$Q_h = F_b \times F_r \times Y \times F_{pb} \times F_{tb} \times F_{tf} \times F_g \times F_{pv} \times F_m \times \sqrt{h_w P_f}$$

While the factors listed in Report No. 3 are listed to four decimal places, the factors are often the product of several variables. Therefore, the committee, in preparing the report, took pains to estimate the degree of uncertainty in the factors. The uncertainty increases with the possibility of error of a common direction in several of the numerous factors.

By BRUCE J. CALDWELL
Measurement Superintendent
Columbia Gulf Transmission Co., Houston

The foregoing remarks should not be construed as derogatory to the orifice meter or as a query on the AGA program. A remarkable job was done to fill an urgent need. Instead, the resumé is presented to justify the thought now given the development of simpler, more economical and more direct measuring devices of equal accuracy.

One such device recently introduced to the industry is the Vortex-Velocity meter, manufactured by Rotron Controls Corp.

• Principle of the Vortex-Velocity meter

Fig. 1 shows a piece of pipe with an offset cylindrical chamber. Gas flowing through the pipe creates a natural eddy in the chamber. The rotation of this whirlpool or vortex is proportional to the main flow through the pipe. There are equations that prove this statement to the hydraulic engineer. In simple language, it can be said that the vortex rolls on a gas stream much as a pulley rides on a belt. Fluid friction (viscosity) acts like the rosin on a belt to keep the pulley from slipping.

Fig. 1 represents a good flow meter except for the lack of a way to count the vortex rotation. *Fig. 2* shows the next step in the construction of the Vortex-Velocity meter. A squirrel cage rotor is mounted in the cylindrical chamber to ride with the vortex as a counter of its rotation. In addition, it helps organize the vortex and hold it steady in the chamber. The important point is that the rotor is part of the vortex, not a paddle wheel. This may be clearly demonstrated in the Vortex-Velocity meter by reversing the direction of flow through the meter, for the direction of rotor rotation does not change with a reversal of flow direction.

The requirements of counting the rotor revolutions is met with a magnetic coupling. A cylindrical magnet on the rotor shaft transmits through a thin, but strong, non-magnetic hub to another outside magnet on a counter or transducer shaft. This imposes small torque on the rotor. Otherwise, there would be slippage with respect to the fluid in the vortex. To the contrary, coupling the rotor to the index with a shaft through a high pressure seal would impose excessive torque and cause slippage.

There are other unique refinements to be found in the Vortex-Velocity meter. Flows are channeled to keep the vortex alive and stable, to keep the rotor from becoming a second cousin to a paddle wheel. A less subtle, but important, channeling of the flow through the meter is shown in *Fig. 3*. A half butterfly valve can be set in various positions to divert any portion of the flow, from half to all, past the rotor. With this bypass channel the natural 10-to-1 rangeability of the meter may be shifted by a factor of 2. This serves to assist when second guesses are in order, or when a crippled pipeline is caught with its flow down.

Basically, the Vortex-Velocity meter is a displacement meter to the extent that it measures volume directly. The revolutions of the rotor are directly proportional to the flowing volume, because the peripheral portion of the rotor is locked to the velocity of the fluid being measured.

In essence, this is the Vortex-Velocity meter, simple of design and with only one moving part, the rotor. Without other refinements, gas measurement technicians may readily surmise that the conversion of index readings to standard cubic feet may be accomplished by applying temperature, pressure and supercompressibility factors to the index readings.

Usually, a two-pen recorder (pressure and temperature) is used with the Vortex-Velocity flowmeter as a means for determining the three correction factors. *Fig. 4* depicts an installation of this category.

This picture of the basic Vortex-Velocity meter is shown to establish its relationship with other displacement meters for the benefit of the reader. However, the concept of the meter as only another measuring device has long been outgrown and the basic unit here described has developed into one having wider and more practical applications. The versatility of the meter is such that volume, mass and therms may be measured separately or collectively with equal agility.

• Mathematics of Vortex-Velocity metering

As stated, the Vortex-Velocity meter basically responds to volume at flowing conditions. Expressed mathematically:

$$Q_f = KN$$

Where Q_f is flowing volume, K is the meter factor (dependent upon meter design) and N is meter rotation. Q_f may be rate or totalized flow, depending on which way N is measured. If standard cubic feet are desired,

$$Q = \left(\frac{P_f}{P_b} \right) F_{pv}^2 F_{tf}^2 K N,$$

where the nomenclature is that used in AGA Report No. 3. Supercompressibility factors and temperature factors are squared here because they were derived in Report No. 3 for quantities under the square root sign.

Multiplying both sides of the basic response equation by actual density gives weight flow:

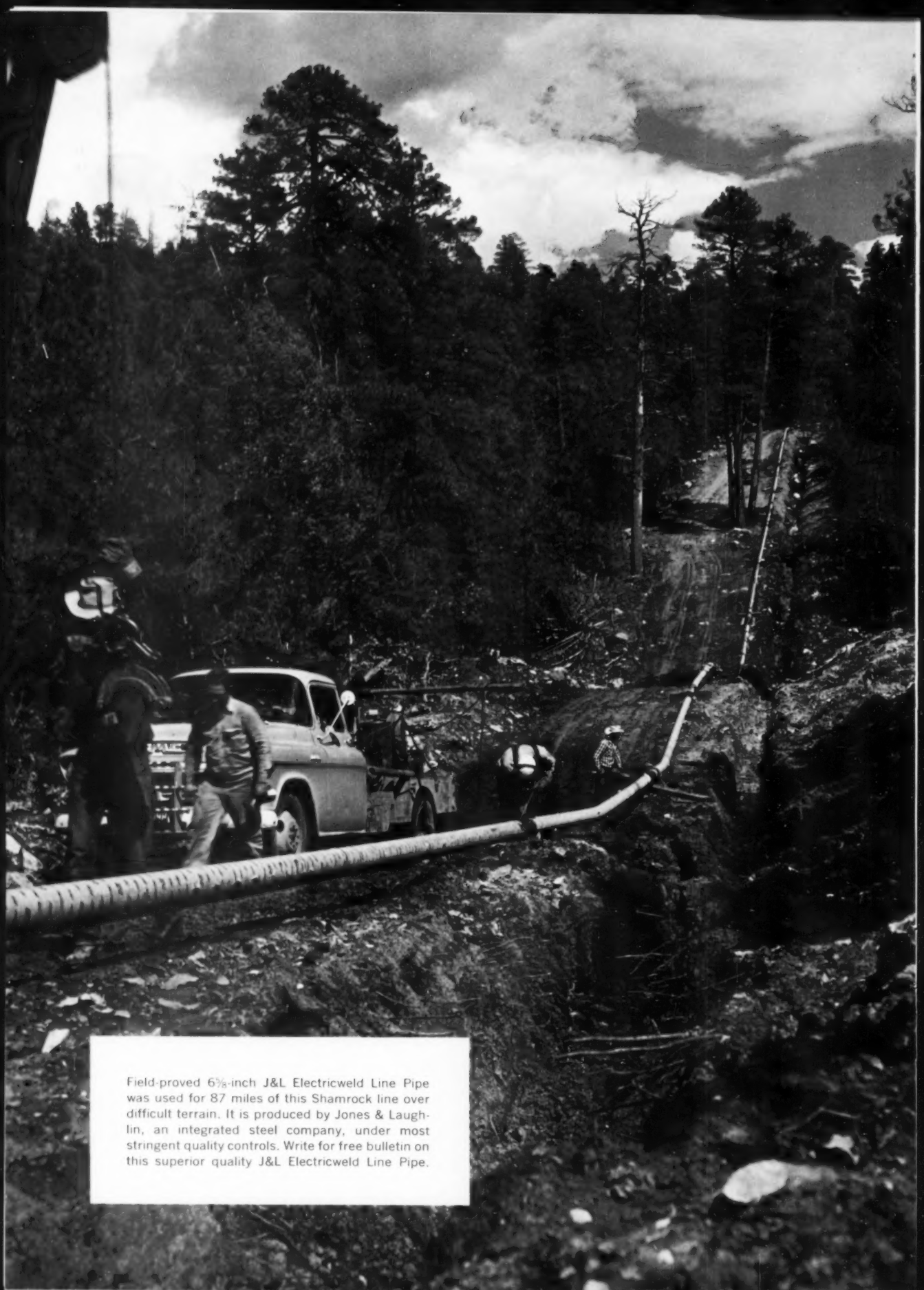
$$W = KND$$

The Vortex-Velocity meter becomes a mass-meter upon inserting a speed changer between meter and readout. The speed changer ratio is mechanically or electrically adjusted in accordance with a density signal. An accessory produces such a signal which can be used directly in a mechanical system or can be turned into a voltage compatible with an electrical computer circuit.

The next logical step in metering mass is to read out directly, in standard cubic feet, a unit of measure more acceptable to the gas industry. The weight definition of one standard cubic foot is

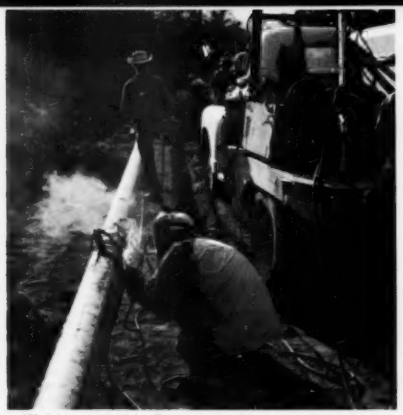
$$W = G D_{ba} Q_b$$

Where G is specific gravity, D_{ba} is density of air at base volume pressure and temperature conditions, and Q_b in this instance is a standard cubic foot under equal conditions. Combining this with the mass metering equation and solving for standard cubic feet,



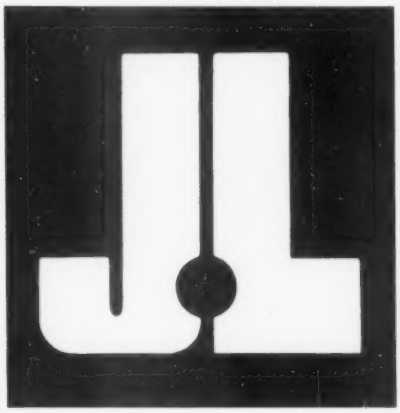
Field-proved 6⅝-inch J&L Electricweld Line Pipe was used for 87 miles of this Shamrock line over difficult terrain. It is produced by Jones & Laughlin, an integrated steel company, under most stringent quality controls. Write for free bulletin on this superior quality J&L Electricweld Line Pipe.

New six-inch products line will be operated by Shamrock for its affiliate, West Emerald Pipe Line Corporation.

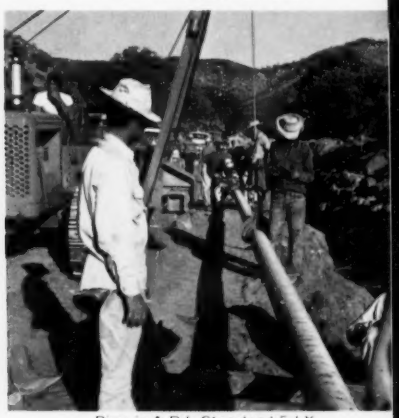


Welders on this Shamrock line reported that J&L Electricweld Line Pipe was uniformly round, easy to weld.

Pipe is produced under strict compliance with appropriate A.P.I. and A.S.T.M. specifications.



Contractors for the rugged section from Palma, N.M., to Albuquerque were Groninger & King, Pampa, Texas.



Pipe is A.P.I. Standard 5 LX, Grade X 42, 12.89 pounds per foot, with a .188 inch wall thickness.

"Superior weldability of J&L Electricweld Line Pipe was proved on this mountainous operation"

. . . reports pipe line contractor

Steep, mountainous terrain presented a real challenge to pipeliners working on this Shamrock Oil and Gas Corporation line from Amarillo to Albuquerque. Eighty-seven miles of $6\frac{5}{8}$-inch J&L Electricweld Line Pipe were used in the rugged section from Palma, N.M., to Albuquerque. Performance proved conclusively that J&L Electricweld Line Pipe bends readily to contour, is easy to weld and is uniformly round. It is readily available from $6\frac{5}{8}$ inches through $12\frac{3}{4}$ inches.

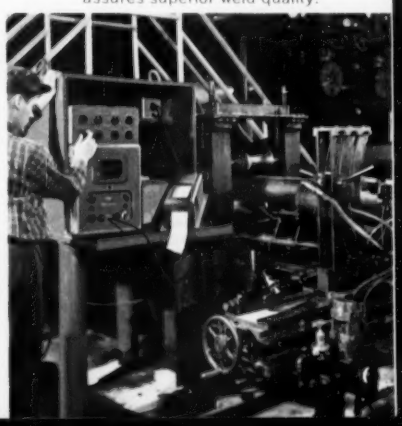
Jones & Laughlin Steel Corporation

PITTSBURGH, PENNSYLVANIA

J&L Electricweld Line Pipe is produced on one of the most modern mills in the world.

Hydrostatic test is one of a series of inspections and tests given every length of pipe.

This modern J&L ultra-sonic tester assures superior weld quality.



$$Q_b = \left(\frac{K}{G\,D_{ba}}\right) DN$$

The fraction (new meter factor) is purposely separated from the variables D and N, because D_{ba} can be permanently absorbed in the meter factor. G can also be incorporated into the constant, provided the specific gravity is relatively constant.

Therms (T), as a unit of heat, can be indicated as a rate or totalized by a system based upon the inclusion of T_{cf} (Therms/SCF) in the equation

$$T = \left(\frac{K\,T_{cf}}{G\,D_{ba}}\right) DN$$

Again, therms may be indicated more directly by modifying the weight equation, wherein the factor T_p (Therms/pound) is added.

$$T = K\,N\,D\,T_p$$

In either instance, therms/pound may be preset or changed concurrently with composition changes by coupling with another instrument. Specific gravity may be handled in a similar manner.

The sprinkling of mathematics in the foregoing indicates that the Vortex-Velocity measuring principle is something predictable and that it enables the designer to go straight to the solution of a gas metering problem. Dependent upon metering requirements, he can pick and choose from a wide variety of mechanical and electrical embodiments to meet job specifications.

• Development started in the field

The Vortex-Velocity meter was originally designed for liquid metering service and its development and application along these lines continues.

Columbia Gulf, learning of the meter as a liquid measuring device, persuaded the manufacturer in early 1957 to lend a liquid meter for preliminary trial in gas service at Columbia Gulf's Leach (Ky.) measuring station.

The results of the Leach tests were such to warrant further work, but they attracted the attention of two other gas pipeline companies, Tennessee Gas Transmission Co. and El Paso Natural Gas Co. Subsequently, two sizes of meters were cooperatively tested by the three natural gas companies and Rotron Controls at the AGA test site on Tennessee's line at Refugio, Texas.

Later, improvements were embodied in a 2-in. prototype and tested on Columbia Gulf's system near Rayne, La., under conditions simulating rugged fuel gas measuring service. Irregular flow rates were imposed on the meter while under test. The meter was later placed in fuel gas measuring service at Columbia Gulf's Rayne dehydration plant.

The improvements found in the 2-in. meter were extended and adapted to an 8-in. meter. A site at one of Columbia Gulf's purchase measuring stations, located at the discharge of The Texas Co.'s Erath (La.) processing plant, was picked for this series of tests. Here an important objective was design data to be used in mass metering.

Following the Erath tests, Tennessee Gas Transmission moved one of the Refugio test meters to its Hebron (Pa.) underground gas storage site. At Hebron, the meter was installed downstream of a reciprocating compressor station to check the behavior of the meter in measuring pulsating flow.

This, briefly, is the outline of a cooperative field development and testing program to be described in more detail, with results and conclusions.

• Preliminary trials at Leach

The 6-in. meter selected for this first test in gas service was designed for liquid petroleum product service and was without many of the refinements subsequently added. *Fig. 5* shows it installed with a dial-type totalizing counter at Columbia Gulf's Leach measuring station.

The Vortex-Velocity meter was flanged in series with a conventional 10-in. orifice metering tube for measurement comparison purposes. It remained in continuous service for several months.

Daily calculations were made to compare the orifice metered measurement with that of the Vortex-Velocity meter. Daily differences were no greater than that to be expected when checking one orifice meter by another, generally within one-half of one per cent, plus or minus. On the other hand, monthly aggregates checked within 0.1 per cent of each other, save for one month where the difference was 0.18 per cent. To a certain point, differences were expected in that the Vortex-Velocity meter was read daily by the person changing numerous recorder charts at the installation. As it was not possible for one person to do this and read the Vortex-Velocity index simultaneously, the time interval between the two operations varied from day to day. In fact, the sequence of events was often reversed. This accounted for some daily differences not reflected in monthly comparisons. The matter of daily orifice meter chart integration tolerances had some effect upon daily differences not reflected in monthly differences because of the laws of average.

While the differences noted between the two methods of measurement were scant, the tests were not accepted as being entirely indicative of overall accuracy for several reasons; namely, the Vortex-Velocity meter was installed in the line contrary to usual practices requiring a minimum footage of straight pipe upstream of the measuring device and there was not enough flow variation to check meter accuracy throughout its range. The meter was installed immediately downstream of a 90-degree ell, a taper-ported plug valve and a 10-in. x 6-in. swage, with another and similar swage being on the outlet end of the meter. The flow rate, specific gravity and flowing pressures were relatively constant. The flow rate ranged from 65 to 70 MMscf per day, the static pressure from 775 to 825 psig and the specific gravity from .600 to .605. The flowing temperature was generally about 70 degrees F. However, the temperature was much lower over a several-day period, accounting for one of the two instances where trouble was experienced with the meter.

At the time of the trouble it was noted that the difference between the two methods of measurement increased to a marked extent. Upon examining the Vortex-Velocity meter internally, the rotor cage

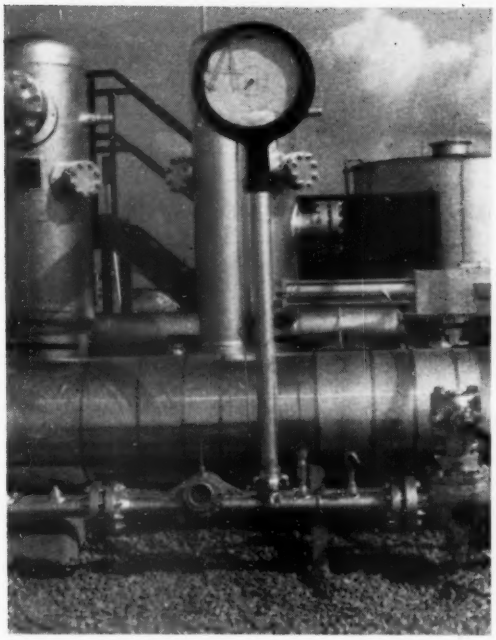


Fig. 4. Two-inch vortex-velocity meter, equipped with pressure and temperature recorder, in service at Columbia Gulf's Rayne dehydration plant.

housing was found to be lined with hydrates. This emulsion accounted for the drag on the rotor and the difference in measurement. An examination of the orifice plate in the reference metering tube showed similar formations of hydrates. In all probability, the reference meter was also not accurate because of a like presence of hydrates.

The only other trouble experienced with the meter stemmed from the lack of rotor shaft bearing lubrication. This particular meter was not equipped with external grease fittings to allow periodic application of grease to the bearing assembly. This was not an oversight on the part of the manufacturer as the meter had been designed for liquid petroleum product service. When in such service the flowing liquid maintains proper lubrication. In this particular instance, the bearings were packed with grease at the beginning of the gas measurement test and it was thought that no added lubrication would be required for an extended period of time. This would probably have been the case had alcohol not been injected to the gas stream. Following the hydrate formation problem, conditions allowing the formation of hydrates persisted for a limited period of time. To combat other possible hydrate formations, alcohol was injected into the fluid stream. It is supposed that the alcohol cut the grease from the bearings. Meters since manufactured for gas service have been adequately equipped with external grease fittings.

Columbia Gulf's experience with the Vortex-Velocity meter at Leach alerted the manufacturer to the possibility of developing a meter strictly for gas service and also elicited interest among others of the gas industry. Also, Tennessee Gas and El Paso Natural became interested in the possibilities of the meter. From this point, tests of the Vortex-Velocity meter were conducted jointly by Rotron Controls, El Paso Natural, Tennessee and Columbia Gulf.

• Cooperative test at Refugio

The Leach test of the 6-in. meter not only covered a narrow range of flows, but also used only about 40 per cent of the meter's capacity. By this time, Tennessee and El Paso Natural had entered into an agreement with Columbia Gulf and Rotron Controls Corp. to continue testing on a larger scale. The 4-company group selected the AGA test site on Tennessee's line near Refugio, Texas. Rotron produced two 6-in. and one 10-in. meter with lubrication fittings for the tests. *Fig. 6* shows the 10-in. meter in service at Refugio, with *Fig. 7* being a photograph of the remote readout console used during the tests.

In the spring of 1958, tests commenced at Refugio. The 10-in. Vortex-Velocity meter was placed in series with a battery of 10-in. orifice metering tubes. The desired volume of gas was diverted from Tennessee's lines through the meters and thence back into their lines by manipulating block gates in the transmission lines. Tests were conducted at intermediate flow rates up to a maximum of 500 MMscf per day.

Tests were made at different flow rates, with the duration of each test ordinarily being one-half hr. A comparison of the two methods of measurement reflected differences at the intermediate test points approximating the Leach experience; that is one-half of 1 per cent, plus or minus. It was noted that the Leach differences were obtained while operating at a relatively constant flow. While the differences noted at Refugio were generally not excessive, it was found that differences at certain flow rates were reproducible. This was attributed to harmonics inherent in the design of that particular meter.

While the volume of gas available at Refugio was ample to test the 10-in. meter to capacity, the reference orifice metering facilities were not flexible enough to allow rapid accumulation of data. The

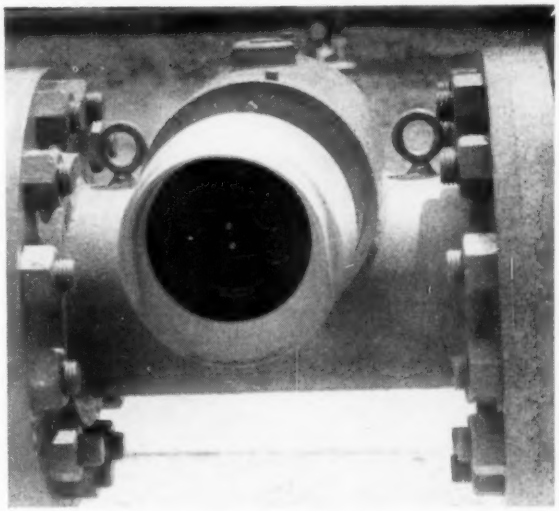


Fig. 5. Six-inch vortex-velocity liquid meter in gas measuring service at Leach, Ky. This shows the first application of the vortex-velocity meter to gas measuring service.

Fig. 6. Ten-inch vortex-velocity meter in 30-in. flow line at Refugio, metering at a rate of 500 MMcfd.

reference installation consisted of a battery of eight 10-in. metering tubes. Individual tubes were not equipped with orifice fittings or valves. To change orifice plate bore sizes, or insert blind plates in tubes, it became necessary to evacuate the gas from several hundred feet of pipe, most of which was of 30-in. diameter under high pressure. To avoid waste of gas, the number of tests was reduced to a minimum.

Upon reviewing the Refugio test data, the participants, while encouraged with the results, were of the opinion that additional tests were in order, preferably at a point where facilities were more adapted to the rapid compilation of data. In view of the test results, certain meter modifications were also deemed desirable before undertaking more extensive tests.

Fig. 7. Rotron Varotron or remote readout console used with 10-in. vortex-velocity meter in Refugio tests.

• Fuel meter test at Rayne

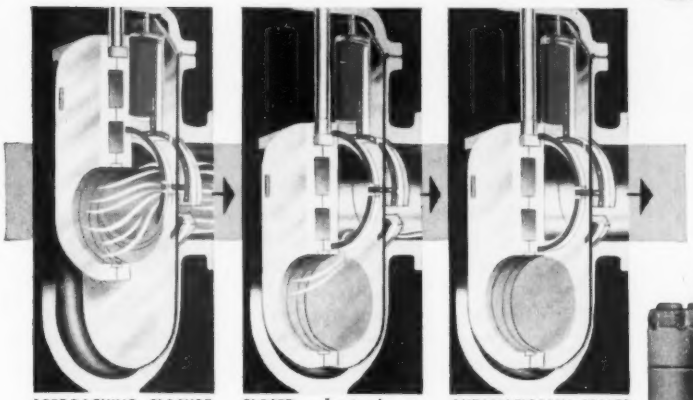
To round out the meter test program, Columbia Gulf decided to look at a utility meter of a size smaller than the 6- and 10-in. pipeline meters previously tested. Accordingly, a 2-in. meter (shown in *Fig. 8*) was purchased from Rotron from early production of their stainless steel line of meters. The design of this meter featured an internal square duct which provided a flow pattern conforming to the figuration of the meter rotor. Part of the flow through the meter was shunted through cross-sections to feed the vortex. The overall result was to correct irregularities in the proof curve.

The 2-in. meter was field-tested at two locations, with proof curves indicating the meter to be sensitive and reliable The meter was later placed in heater-fuel measuring service where irregular flow was expected. Had an orifice meter been used in this service, a "paint brushed" chart would have resulted, providing a chart record that could not be integrated to a high degree of accuracy.

Experience to date has justified this application of the Vortex-Velocity meter. The 2-in. meter has a maximum capacity of 1 MMscf per day for each 100 lb of metering pressure. While this indicates a ca-

For pipeliners who hate leaks!

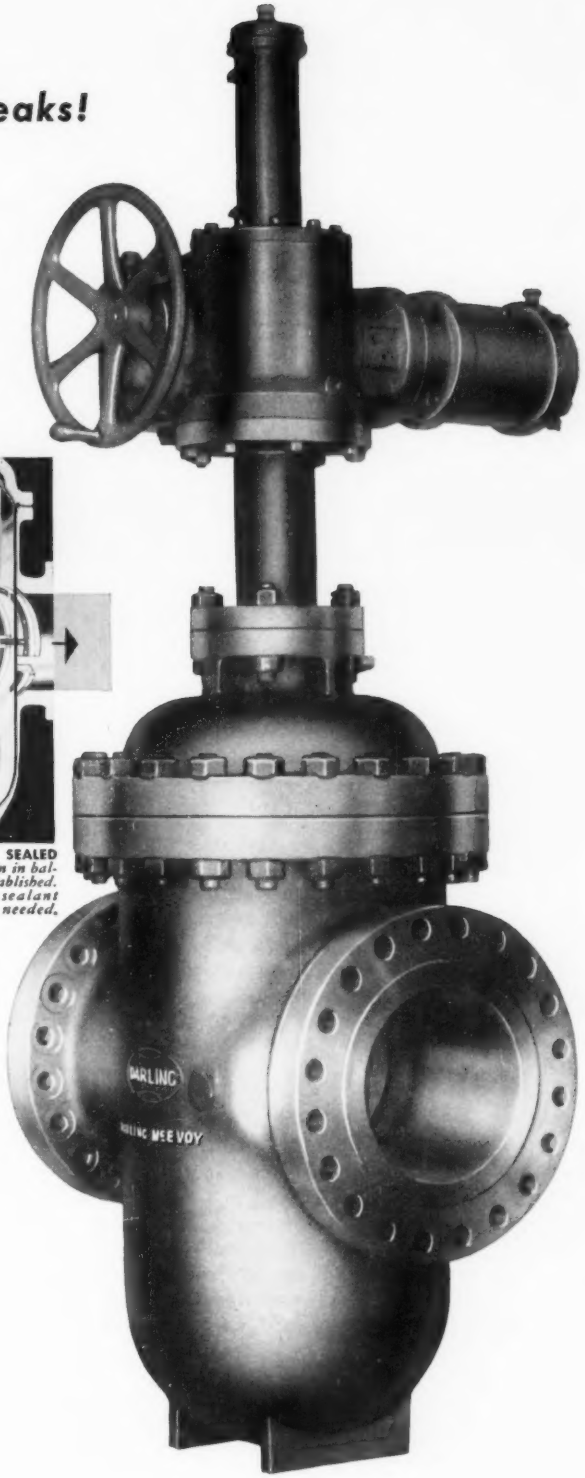
DARLING-McEVOY SELF-SEALING CONDUIT VALVES



APPROACHING CLOSURE ... *No loss of sealant as sealing groove in seat is disconnected from reservoir until gate is fully closed.*

CLOSED ... *Jumper in gate now permits differential pressure to feed sealant into seat groove to check any remaining flow.*

AUTOMATICALLY SEALED ... *Pressures again in balance. Tightness established. No additional sealant used until again needed.*



THE DIAGRAMS above show how these unique conduit gate valves seal themselves *automatically* . . . by means of a long lasting reservoir-held sealing compound . . . for leak-proof, pressure-tight closure every time! This feature, with flow in either direction, self-aligning non-wedging gates, and fully protected non-distorting seats, means exceptional performance, utility and service life. For additional information on these fully field-proved Darling-McEvoy valves, ask for Bulletin 5402.

DARLING VALVES

DARLING VALVE & MANUFACTURING CO.

Williamsport 26, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Company, Ltd., Galt 19, Ontario

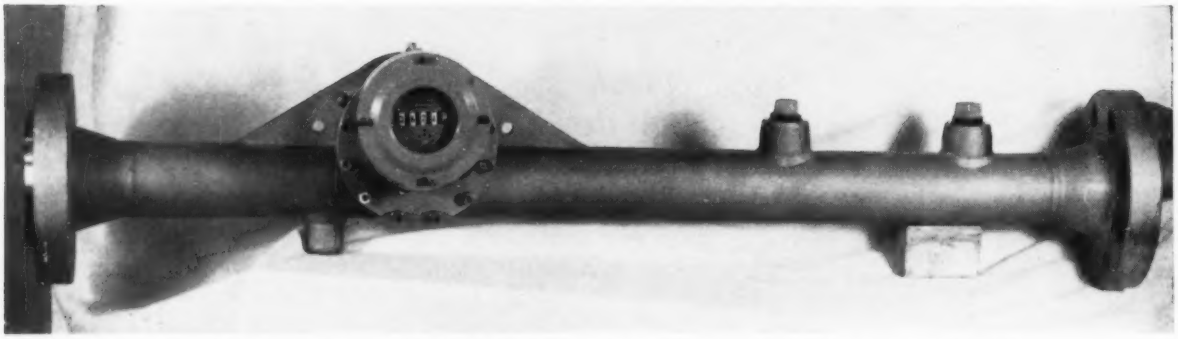


Fig. 8. Two-inch stainless steel vortex-velocity utility meter tested for fuel measuring service at Rayne, La.

pacity of 10 MMscf per day when metering at 1000 lb, the capacity should be somewhat reduced for general design and application.

The utility meter may be used to meter and read standard cubic feet into its index when the meter is installed in a line between two pressure-reducing regulators. When operating at constant conditions, meter readings are equivalent to mass readings. Conversion factors can be entered by selective gearing between the rotor and the index. This meter should find wide application in pipeline systems, where there is a desire to meter compressor engine fuel or heater fuel without the ado of calculating charts. Another application is the metering of gas-lift gas to producing ground formations.

• Flow metering tests at Erath

In continuing the gas meter test program, a purchase measuring station location on Columbia Gulf's system at Erath was picked for the next series of tests. This station was located at the discharge of one of The Texas Co.'s gas processing plants, where 100 MMcf of gas per day was available while tests were in progress.

An 8-in. Vortex-Velocity meter was selected for these tests (shown in *Fig. 9*). The manufacturer, Rotron Controls, constructed the meter with internal vanes similar to those used in the 2-in. meter. In addition, a "calibrating flapper" or butterfly valve mechanism (see *Fig. 3*) was inserted in the rotor bypass segmental conduit. The calibrator was provided with an external control lever and a micrometer scale for positioning the internal flapper to the degree desired.

The calibrating mechanism was installed to serve several functions. With the ability to control shunt-flow gas, the relative size of the meter could be changed at will. With the bypass conduit fully open, the capacity of the meter was found to exceed twice that of the meter when the bypass was fully closed. The flapper was designed to allow any degree of partial closure. Optimum rotor speed could be selected, depending upon the anticipated load at any particular time. The calibrator could be used to change the range of the meter, thus serving a function similar to the changing of orifice plate bores in an orifice meter to obtain a desired recording range.

The Vortex-Velocity meter was designed for a top rotation speed of some 8000-9000 rpm. Tests indicated that the range of accuracy extended downward to the 400-500-rpm level. Where 8000 rpm compares with 100 in. of orifice meter water manometer differential pressure on a 0-100-in. range meter, the 400 rpm compares with ¼ in. of water differential pressure. Below the 400-rpm speed the Rotron meter developed drag and lost its accuracy. As authorities attribute inaccuracy to the orifice meter at recording levels far above ¼ in. of water differential pressure, the accuracy range of the meter under test was assumed to be much wider than that of the reference meter.

While the capacity of the Rotron meter was found to be some four times that of an orifice meter of equal size, and with a wide range of accuracy, practical operation of the meter called for rotor revolution speeds in the 2000-6000-rpm range. The calibrating mechanism enables the operator to select optimum rotor revolution rates when confronted with either abnormally low or high rates of flow.

The Erath tests were primarily instigated to check the effectiveness and accuracy of a meter with flow directing vanes and the calibrating mechanism, to be followed by tests to determine its accuracy as a mass-flow meter. Some 2000 tests were conducted,

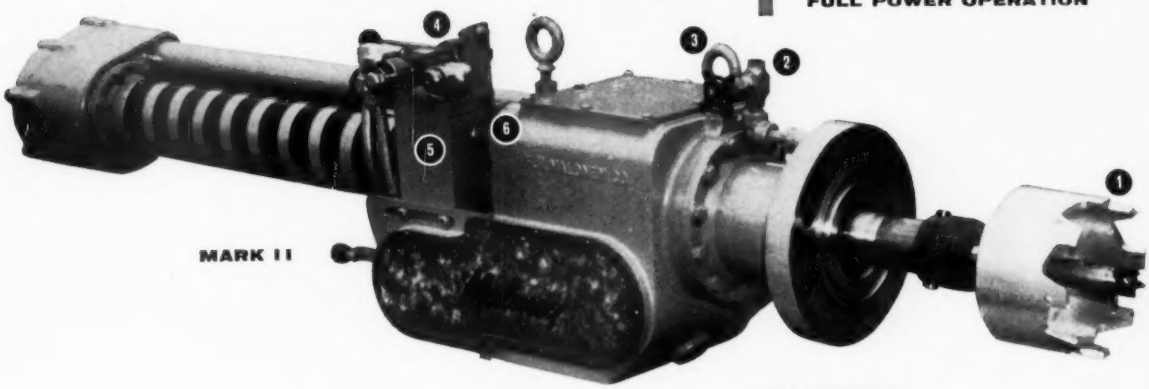
Fig. 9. Eight-inch vortex-velocity meter used in Erath tests Note external control of calibrating mechanism attached under-side of metering tube, immediately downstream of rotor housing.

Completely NEW High-Pressure Pipe Tapping Machines

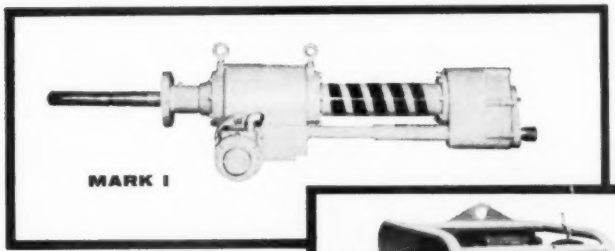
Maloney

MARK I
1 to 6 inch
air or hand crank

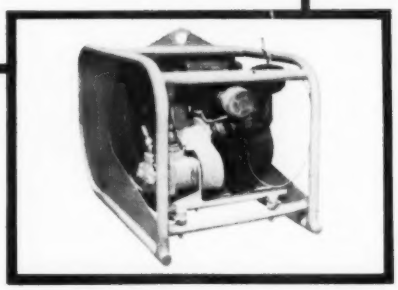
MARK II
4 to 16 inch
air or hydraulic
FULL POWER OPERATION



Over two years of intensive research and field testing have produced these all new high-pressure Tapping Machines. Conservatively rated at 1440 psi at 100° or 700 psi at 700°, the Maloney MARK I and MARK II incorporate every desired feature for rapid, safe, and accurate hot tapping, with complete power operation. Engineered and manufactured by the F. H. Maloney Company, completely within our own manufacturing facilities.



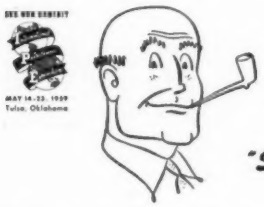
Based on the same design as the MARK II, the MARK I covers the range of high pressure taps from 1 inch to 6 inch. Available with air motor or hand crank operation, the MARK I is rated at the same operating pressures and temperatures as the MARK II. Twist drill cutters are available to 3 inch, shell type cutters to 6 inch. (MARK I Air Requirements 90 psi, @ 105 cfm.)



Companion Hydraulic Power Unit powered with 9 hp gasoline engine, completely self-contained. Provides ample power and positive control of cutter torque with calibrated, infinitely variable, flow control. Available as an accessory with the MARK II. (MARK II Air Requirements — 90 psi, @ 105 cfm.)

FEATURING

1. Revolutionary shell cutters provide cleaner cutting with less torque. Replaceable teeth, shell, and backplate for field maintenance.
2. Integral bleed-off valve.
3. Center of gravity well forward, near the cutting end of the machine, for easier handling. Vertical and horizontal operation with built-in lifting rings and bail.
4. Air or Hydraulic power (MARK II only), with ample reserve power. Completely reversible—makes the *full range* of cuts without alteration.
5. All operating controls grouped for simple operation.
6. Boring bar travel counter measures travel in .01 inch increments. No guessing where the cutter is.
7. Simplified design eliminates unnecessary maintenance. Designed to be operated and maintained by *your* operating personnel.



New
"Something From the Irishman"

F. H. Maloney COMPANY

Post Office Box 1777 • Houston 1, Texas

CHICAGO • LOS ANGELES • PITTSBURGH • TULSA

in which the Vortex-Velocity metered volumes were compared with those measured in series with a 10-in. orifice meter. Six different orifice plate bore sizes were used with the orifice meter, ranging from a 10-in. x 2.000-in. bore to a 10-in. x 7.000-in. bore plate. A series of tests was conducted, ranging from 10 in. to 100 in. of water differential pressure across the reference orifice meter. Nearly all tests, irrespective of reference orifice plate size or calibrator set position, agreed within + or — 1 per cent. However, it was noted that the greatest differences occurred with changes of reference orifice plates and not with the resetting of the calibrator. At any calibrator set position, using any given orifice plate size, a plot of the difference between the two methods of measurement versus flow rate indicated a straight line relationship. A plot of the difference in measurements, using other orifice plates and with no change to the Vortex-Velocity meter, reflected a straight line relationship but a difference of another magnitude. All of which indicated the possibility of error in the reference orifice measurement and not in the meter under test. In fact, a nick on an orifice plate (not previously noted) was detected as a result of questioning the differences in a test series which had departed radically from the norm.

Differences were no greater than 1 per cent, usually falling within 0.25 per cent, plus or minus. Some difference may possibly be attributed to the reading of the Vortex-Velocity meter index. Test periods were of a short duration, with a stop watch being used to measure the time interval between start and stop index readings. The stop watch was read to the nearest second. Considering the duration of the test interval and the fact the index was read in motion, some error may have resulted.

Summarizing the flowmeter phase of the Erath tests, it was the consensus of the participants that the Vortex-Velocity meter measurement agreed with the reference orifice meter measurement as well as one orifice meter could be expected to agree with another in monitoring a common stream. The calibrating mechanism and the internal ducts were found to be effective and it was recommended that the manufacturer incorporate these items into its standard gas flowmeter design.

• Pressure drop tests

Aside from the accuracy aspects of the Vortex-Velocity meter, pressure readings were taken at Erath to determine the pressure drop across the 8-in. meter. All readings were taken when there was 780 psi on the meter. There was a 3-oz. pressure loss across the meter at a flow rate of 26 MMcf per day, 10 oz. at 54 MMcf per day rate, 1.15 psi at 72 MMcf per day and 2.5 psi at a 100 MMcf per day rate.

At the 100-million rate, with three 10-in. orifice metering tubes in service, the header-to-header pressure drop across the orifice metering installation exceeded twice that across the single 8-in. Vortex-Velocity meter.

While inlet and recovery cones are not a standard design feature of the Rotron meter, the cones were not used at Erath. Had they been available, in all probability the net pressure drop across the Rotron meter would have been even less than that obtained.

• Mass measurement calculations

Upon concluding the flowmeter aspects of the Erath tests, calculations were made to determine the effectiveness of the Vortex-Velocity meter in measuring mass.

The value of the pound as a unit of gas measure and the need of an accurate mass measuring device prompted this phase of the test series. All participants realized the beneficial aspects of measuring mass instead of volume. The arguments for mass flow metering center around the error inherent in the multitude of separate measurements and the calculation time required to determine volume. Also recognized was the relationship of pounds to therms, in the case of hydrocarbon gases.

As indicated previously, a signal proportional to flowing density is needed to convert metered volume to pounds. Differential pressure of the reference metering tube, immediately upstream from the Vortex-Velocity meter at Erath, being proportional to density and velocity, was used to calculate the density. Rotron had conceived a suitable density transducer without the penalizing pressure drop characteristic of an orifice plate, but this was not on hand at the time of the Erath tests.

Without benefits of a calculator to couple with the meter at Erath to integrate rotor revolutions, differential pressure and time, mass was readily calculated by using the Vortex-Velocity meter index reading and the record of a single pen recorder providing time and differential pressure.

To check the accuracy of the massmeter, the orifice meter previously used for volume measurement comparison purposes was again used. Volumes by

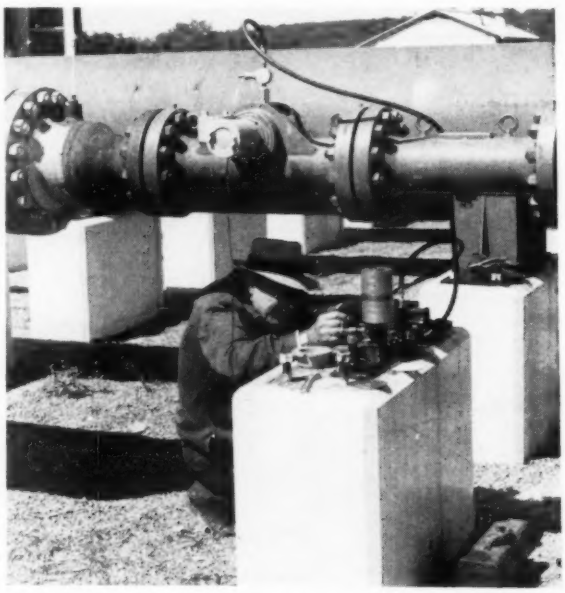


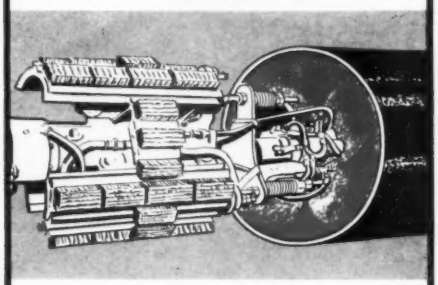
Fig. 10. Six-inch vortex-velocity meter used to measure pulsating flow at Tennessee's Hebron compressor station. Pulsation dampeners are in the background.

Conclusive evidence proves

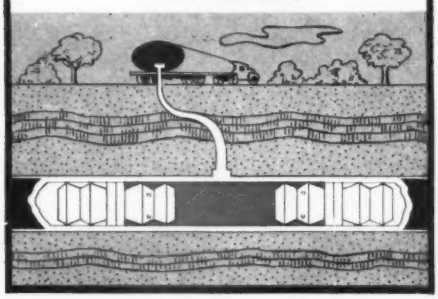
Copon Internal Pipe Coatings Increase Thru-put, Reduce Pumping Costs

Greater efficiency for planned or existing systems

NEW PIPE



PIPE IN GROUND



Extensive tests conducted by major transmission firms

Now, proof positive that Copon Internal Pipe Coatings do even more than provide outstanding corrosion protection, reduce maintenance costs, and make possible delivery of cleaner gas products. Recent tests conducted by major gas transmission firms **prove conclusively** that Copon Internal Pipe Coatings improve the efficiency and performance of a pipeline system. The smooth interior finish of Copon Coated Pipe *permits greater thru-put . . .* makes possible *reduced pumping costs.*

These tests are the most recent development in a continuing research program being carried out by the manufacturers of Copon. All Copon Internal Pipe Coatings are developed in close cooperation with pipe line engineers, corrosion engineers, coating applicators and equipment manufacturers. The information gained from this research is available to the purchaser in the form of a complete technical service. **When you specify Copon, you get the performance you pay for.**

● *Ask your Copon representative for complete information on Copon Internal Pipe Coatings . . . and for specific information on increased thru-put and reduced pumping costs.*

Copon®

FOR CORROSION CONTROL

Coast Paint & Lacquer Co.

P.O. Box 1113 • ORchard 2-6641

Houston 1, Texas

orifice measurement were converted to pounds of gas and were assumed to be unity. Upon comparing the results of some 75 tests, differences between the two methods did not exceed 0.4 per cent, plus or minus. Individual test differences were more often of the order of 0.25 per cent or less, plus or minus.

The lesser number of variables in the mass equation, and the simplicity of the calculations, recommends the mass metering approach to the measurement of volume. The pounds-of-gas equation is found to be adaptable to the need for volume determination once the specific gravity of the gas is known. Contractual requirements are such that cubic foot or therm units are standard for dispatching, accounting and billing purposes at present. Therefore, the pounds-of-gas equation is of doubtful value until such time as the relationship between pounds of hydrocarbon gases and therms is better appreciated. Certainly, at some future time, the pound of gas will be valued in its true light as a measure of heat.

• Pulsating flow metered at Hebron

No tests were conducted at Erath to determine the accuracy of the Vortex-Velocity meter in measuring pulsating flow. However, tests were made by Tennessee Gas Transmission Co., independent of the 4-company test group.

To conduct these tests, a location was selected downstream of Tennessee's Hebron compressor station, a compressor station of the reciprocating type. Downstream of the station was installed pulsation-dampening equipment, followed by a conventional orifice metering station. The orifice metering installation was used for reference measurement. Vortex-Velocity meters were installed in the flow line, both upstream and downstream of the pulsation dampener. *Fig. 10* shows the meter in place with a pulsation dampener in the background.

The results of these tests indicated no noticeable measurement effect from pulsation. This result was contrary to previous tests at the same location which had measured the effect of pulsation upon orifice measurement.

• General conclusions

Upon terminating the test program and examining the data at hand, the following conclusions were drawn:

1. The Vortex-Velocity meter is capable of measuring gas to a degree of accuracy equal to that of an orifice meter.

2. The meter has advantages over the diaphragm-type displacement meter, except at low rates of flow where the latter excells.

3. The meter is inherently more adaptable to the telemetering of flow than many other metering devices.

4. The meter is economical from the standpoint of initial installation cost, primarily because of the capacity of the meter and its metering range when compared to other meters of equal size.

5. The meter is economical from the standpoint of operation and maintenance cost, because of the simplicity of the meter and the reduction in calculation time.

6. Apparently, the meter is capable of metering a given quantity of gas with less resulting pressure loss than more conventional devices.

7. The data of one series of tests indicate the meter is not materially affected by pulsating flow.

8. The meter is adaptable to the measurement of inconstant gas flow rates in that the rotor senses velocity and reads same into an index, instead of "paint brushing" the inconsistent flow onto a chart to create chart interpretation difficulties.

9. The flexibility of the basic meter is such to enable the user to obtain a wide range of information, whether it be volume, pounds, or therms.

• Outlook

The results of the two-year testing program spurred developments that have pointed the way to additional desirable meter features. Some of these systems, now available or in final stages of development, are presented as a matter of interest.

1. All-mechanical temperature-compensated utility meter for installation between pressure regulators. The totalizing index of this meter to read in either pounds or cubic feet, reduced to base pressure and base temperature conditions (standard cubic feet).

2. Remote readout console, including automatic calculating system, to register totals or indicate rates of gas flow in a choice of pounds, standard cubic feet or therms; or any combination thereof.

3. A metering system for telemetering digital flow rates at line conditions to a central computer to be converted to pounds of gas, standard cubic feet or therms. This system to cater primarily to check measuring installations.

In converting pounds of gas to either standard cubic feet or therms by pre-setting specific gravity or therms-per-pound into a calculator, there will be accuracy limitations upon monitoring a stream of changing composition. When this condition prevails, the set points may be automatically changed concurrently with composition changes by coupling the calculator unit with a process analyzer. One manufacturer of chromotographic gas-analyzing equipment states that its units are so designed to provide the necessary functions at nominal cost.

While both the calculator and the process analyzer are uneconomic in measuring small rates of flow, the needs of the industry are such to justify wide acceptance of this or similar devices. At any rate, the combining of a mass-flow-meter, volume-meter and a therm-meter into a single unit should stimulate interest within the industry and further the trend toward the examination of established gas measurement precepts. ■

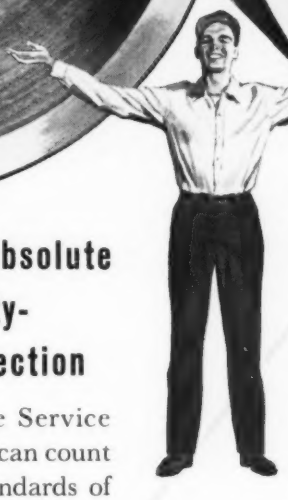
ACKNOWLEDGMENT

The writer gratefully remembers the active help and wise counsel of his fellows of the gas industry when about the tests leading to this article. Particular thanks should go to E. S. Plank, measurement superintendent, and Loy Upp of Tennessee Gas Transmission Co.; J. R. Purvis, measurement superintendent, and Harry Bean of El Paso Natural Gas Co.; Ralph Williams, Charles Truby, and Howard McDonald, engineers of Gulf Interstate Gas Co. Rotron Controls Corp. deserves thanks also. J. C. van Rijn, president, provided the equipment; B. A. Knauth, consulting engineer, was on the spot with his ideas; and A. B. Hubbard, research engineer, aided in evaluating the test data.

Coated and Wrapped Miles Apart

YET.

IDENTICAL TWINS!

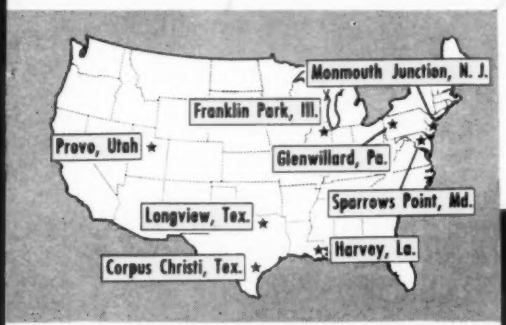


Dramatic proof of the absolute uniformity of PLS quality-controlled pipeline protection

No matter which Pipe Line Service Plant is applying protection, you can count on the identical high quality standards of *uniform protection* . . . mile after mile of pipe.

Pipe Line Service protection can provide this kind of identical uniformity due to precisely controlled production, using methods and machines which have been specially developed for this purpose over a long period of time.

Why not make sure of maximum service life for your pipe investment . . . with *uniform* Pipe Line Service protection? Like the chain with a weak link, lack of uniformity is equivalent to no protection at all. Get full details from the Pipe Line Service sales office nearest you.



Sales offices at all plant locations . . . and Atlanta, Ga.; Dallas, Tex.; Houston, Tex.; Lincoln, Nebr.

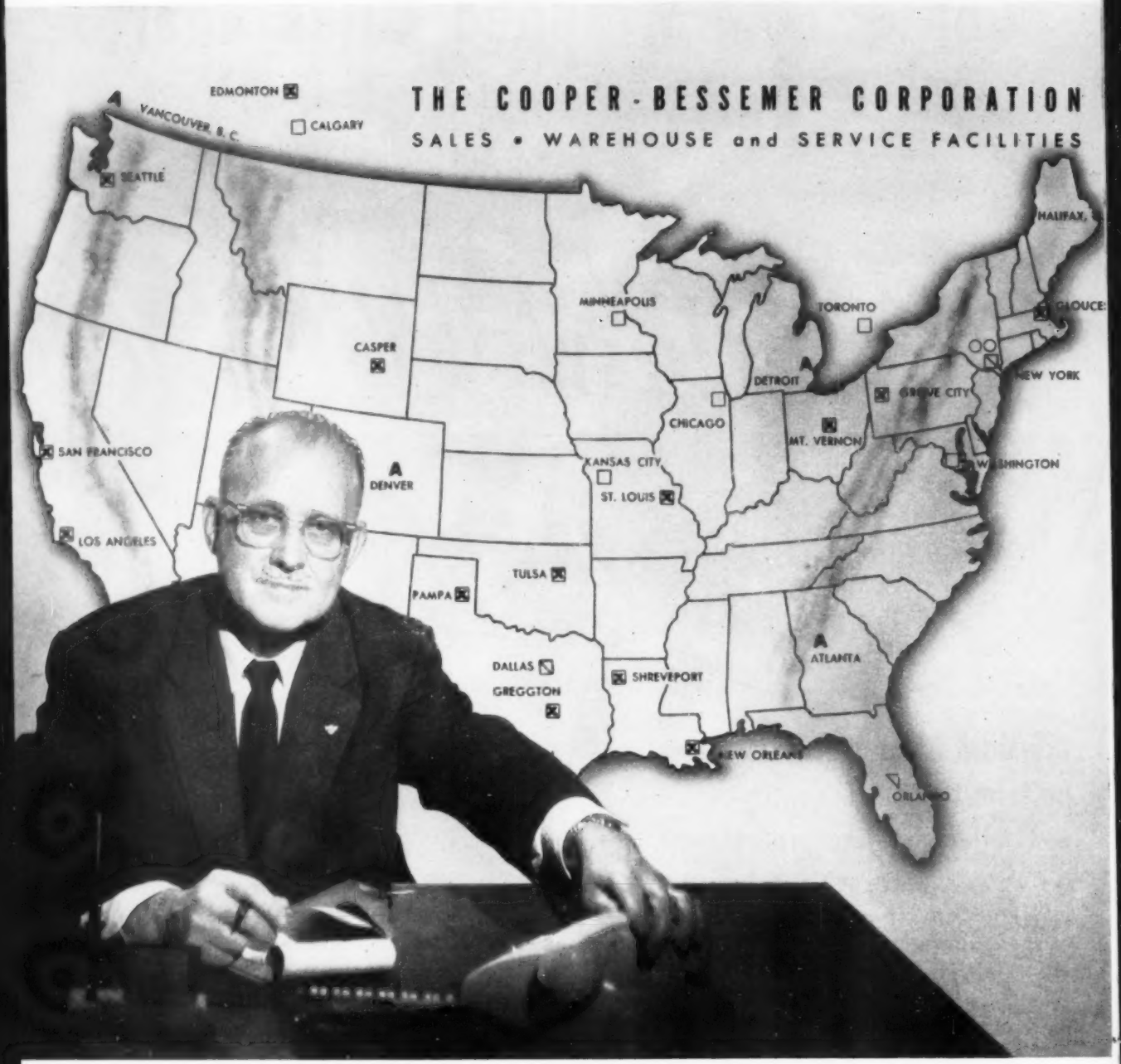
PIPE LINE SERVICE CORP. SERVICE EQUIPMENT MATERIALS FRANKLIN PARK - ILL.

Pipe Line Service Corporation

General Offices and Plant: Franklin Park, Ill.

Quality pioneers in coating and wrapping pipe for a quarter century

A SUBSIDIARY OF AMERICAN STEEL FOUNDRIES

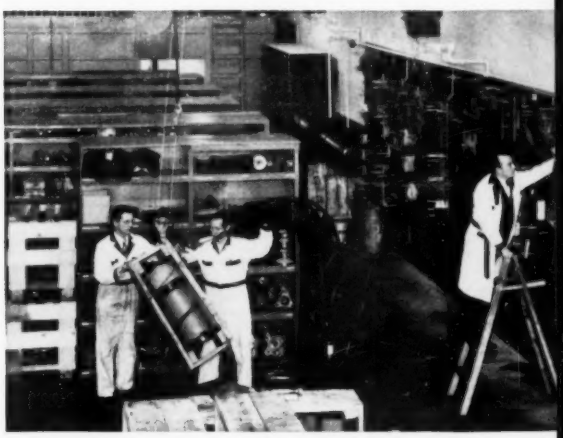


Edmund S. Budd, *Manager of Parts Division, The Cooper-Bessemer Corporation, points out that...*

You are this near to Cooper-Bessemer service!

Cooper-Bessemer engineers are ready to assist you in planning power or compression facilities, or solving operating problems.

Experienced Cooper-Bessemer field technicians assist you in installation and servicing of equipment.



Cooper-Bessemer warehouses, strategically located, provide replacement parts for speedy servicing and peak availability of your facilities.

WHEN YOU INVEST in Cooper-Bessemer engines, compressors or controls, our service facilities are as close to you as the telephone . . . night and day! We serve you in these three important ways:

Technician service. Our skilled installation and maintenance crews are permanently located in areas throughout the country, ready to assist you, to assure top economy of operation and availability of your Cooper-Bessemer equipment.

Warehouse service. We maintain an extensive inventory of replacement parts for Cooper-Bessemer products in strategic locations to give prompt attention to your needs.

Engineering service. As new or changed conditions arise, our experienced field service engineers can give you on-the-spot recommendations. And they are backed up by the strong team of Cooper-Bessemer engine and compressor engineers in Mount Vernon.

The superiority of Cooper-Bessemer Service can save you thousands of dollars yearly in capital investment and in operating cost. Make sure you take this important *plus value* into account when you specify and buy engine and compressor facilities.

BRANCH OFFICES: Grove City • New York • Washington
Gloucester • Chicago • Minneapolis • St. Louis • Kansas City • Tulsa
New Orleans • Shreveport • Houston • Greggton • Dallas • Odessa
Pampa • Casper • Seattle • San Francisco • Los Angeles

SUBSIDIARIES: Cooper-Bessemer of Canada, Ltd. . . . Edmonton
Calgary • Toronto • Halifax
C-B Southern, Inc. . . . Houston
Cooper-Bessemer International Corporation . . . New York • Caracas
Mexico City

Cooper Bessemer

GENERAL OFFICES: MOUNT VERNON, OHIO

ENGINES · GAS · DIESEL · GAS-DIESEL
COMPRESSORS: RECIPROCATING AND CENTRIFUGAL
ENGINE OR MOTOR DRIVEN

Edited by FRANK CHAPMAN

AT&T complying with FCC ruling

AMERICAN Telephone & Telegraph Co. advised the FCC by letter dated Feb. 10, 1959, that it would terminate its private mobile lease-maintenance activities as of Jan. 24, 1961. That is the cut-off date specified in the Jan. 24, 1956, Bell consent decree.

At the same time, AT&T requested the commission to withdraw Tariff No. 235 covering interstate lease-maintenance activities. This action will, of course, render the overall lease-maintenance proceedings in Docket 11972 moot.

Both the API central committee and the Petroleum Industry Electrical Association have opposed AT&T's private mobile lease-maintenance activities consistently—both before the FCC and before the California Public Utilities Commission. In the former case, central committee and PIEA opposition centered on the FCC proceedings in Docket 11972 concerning the commission approval of Tariff 235 covering interstate lease-maintenance activities.

In the latter case, PIEA filed an *amicus curiae* brief with the California PUC last year taking the view that whether regulated or not, the 1956 Bell consent decree prohibited the state of California from regulating the Pacific Telephone & Telegraph Co.'s intrastate lease-maintenance operations. The basic position of both the central committee and the PIEA was that private mobile lease-maintenance activities were not common carrier communications activities and therefore not capable of being regulated as a common carrier activity by either states or the Federal Communications Commission.

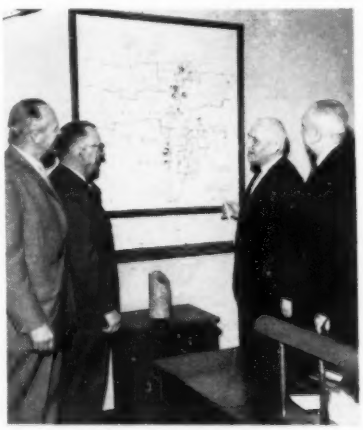
Now that AT&T has stated it will withdraw from private mobile lease-maintenance activities in 1961, it is apparent that the fundamental differences between private and common carrier licensees of the commission will be brought to bear in the forthcoming hearings in Docket 11997 relating to the allocation of the frequencies between 25 and 890 megacycles. AT&T has proposed a broad band common carrier mobile service to provide for the needs of mobile radio users in the U. S. Private mobile users must insure the availability of sufficient private mobile frequencies to provide for the present and future expanding needs of their respective industries.

In its letter to the secretary of the FCC, AT&T states: "Looking to the future, we hope to provide common carrier private line mobile radio services on common carrier frequencies licensed to us where there is a public demand that such services be furnished by the telephone companies. At the present time, however, no such general public offering can be made because of the lack of the necessary common carrier frequencies."

AT&T further states that "There are, however, a limited number of cases where there are two or more interconnected radio base stations which are an integral part of a private line network furnished by the telephone companies. In these cases, customers service considerations may make it most desirable that the base stations be furnished by the telephone companies. In such cases, the telephone company is willing to provide the base stations, as a part of the network, on a common carrier basis utilizing a frequency allocated to the service involved not only where the customer requests and the commission permits the telephone company to be the licensee for the frequency on which the base stations operate. Also in these cases, the customer would provide and maintain the mobile stations and be licensed for the frequencies used by the mobile transmitters."

This proposal of AT&T is consistent with its original filing in 1957 in Docket 11997 wherein AT&T proposed to be licensed in the individual Safety and Special Radio Services to provide such customer service as now proposed.

It is reported that Pacific Telephone & Telegraph Co. will move to withdraw its lease-maintenance tariff in California which had already been accepted by the California commission. ■



L. R. Kirk, Ohio Fuel Gas chief geologist (with pointer), locates site of new deep test well in Hinckley township, Medina county, Ohio, where natural gas was discovered more than a mile underground. The discovering was made in previously unexplored strata of rock. Looking on are (from left) H. A. Titsch, manager of production; C. J. Hauck, production general superintendent and W. E. Ferguson, retired vice president in charge of production and storage.

TELETAX* TELEMETERING

by Foxboro...

engineered for the most advanced transmission techniques

Telemetering matched in performance with famous Foxboro instruments — that's the Foxboro Teletax Telemetering System.

Through use of impulse-duration signals, Teletax electrically transmits measurements of a remotely-located variable to the central control station. Here, the Teletax receiver records the duration of impulse, which is directly proportional to the measured variable.

The Foxboro Teletax System is noted for its simplicity, its versatility, and its high sustained accuracy. For a transmission medium, it can use either AC or DC, an audio frequency carried on a transmission line, or radio or microwave impulses. Sustained accuracy is 0.5% of full scale.

TELETAX RECEIVERS

Teletax receivers include: Single or Dual Receivers; Multi-Record Receivers for recording up to 6 separate measurements on one chart; and Teletax Receiver-Controllers for automatic operation. And the Teletax signal can be simply converted to digital information.

TRANSMISSION LINK

With Foxboro's Teletax Telemetering System, you can use the most advanced transmitting techniques: two wire lines, power lines, radio or microwave. As many as 25 different signals can be handled in each direction, simultaneously.

TELETAX TRANSMITTER

The Teletax Transmitter houses either one or two standard Foxboro measuring elements — plus the Teletax transmitting mechanism. It will transmit to a control center hundreds of miles away just as easily as to one nearby. It also indicates or records locally if desired.

The Teletax Transmitter needs no periodic maintenance whatever, while the receiver requires only occasional oiling. And the receiver has a minimum of mechanical components to wear — no clutch to slip or jam.

Foxboro Teletax Systems are now in wide use on natural gas systems, water works, oil fields, power plants, steel mills, etc. Write for Bulletin 17-11C — it gives all the details. The Foxboro Company, 344 Norfolk Street, Foxboro, Mass.

*Reg. U. S. Pat. Off.

FOXBORO
REG. U.S. PAT. OFF.
TELETAX TELEMETERING

Balance tipped against Transco-Con Ed Service

Transcontinental Gas Pipe Line Corp.'s proposed transportation service for Consolidated Edison Co. of New York was turned down by the FPC (Dockets G-13143 et al). The gas was to be used for boiler fuel in a steam-electric plant in Manhattan.

The proposed transportation (X-20) service for Con Edison involved the construction and operation of pipeline facilities costing an estimated $20 million to boost Transco's system capacity by 50 MMcf a day.

Militating in favor of the X-20 service was the fact that most of the conventional requirements of public convenience and necessity were satisfied. However, the commission said, there are a number of important factors opposing the grant which "tip the balance" against granting the request. Among other things, the commission pointed out that authorization of this and similar proposals would preempt for this usage capacity which otherwise would be available to meet more urgent and widely beneficial public needs.

The commission said that while the idea of relieving the United Nations headquarters of an unpleasant and annoying smoke nuisance from the boilers under which this gas was proposed to be burned "is an appealing one," it pointed out that the gas would be used in only one of the two Waterside plants, and under only two of eight boilers at that one. It also said that additional volumes of gas contemplated to be transported in the future would not be burned at the Waterside station at all, but at some other facility.

The FPC said that gas distributing companies may find it to the advantage of their customers to seek new sources of gas in the field rather than to rely on pipeline suppliers, but there are risks of grave disadvantage as well. It said the impact of large demand on relatively limited supply is certain enough to raise rates and field prices if only one bidder is bringing that demand to bear on the supply. And, the FPC indicated that the impact would be much more serious when it is in the form of multiple bidders, each attempting to reserve to itself a firm supply.

The FPC disagreed with Presiding Examiner William J. Costello. In his initial decision Costello held that the end use of gas was not a factor to be considered in applying the standard of public convenience and necessity to a proposed transportation, so long as the end use had no relationship to or effect on any jurisdictional service. Citing previous commission and court decisions where end use was considered with respect to the sale of gas, the FPC said it saw no justification for concluding that end use should not be considered in the case of transportation of gas also.

At the same time, the FPC denied a request that Transco be directed to sell gas to Lynchburg (Va.) Gas Co.'s wholly owned subsidiary, Lynchburg Pipe Line Co., which in turn would resell the gas primarily to an industrial user.

Lynchburg Gas sought 6.5 MMcf daily for resale through Lynchburg Pipe Line to a paper company for boiler fuel. During peak periods the pipeline company would resell the gas to its parent as required. Lynchburg Gas' present supplier, Atlantic Seaboard Corp., opposed the plan.

The FPC said that the requested sale was not sustained on the record and that when a project depends heavily on potential industrial customers for its feasibility, relatively firm commitments from such customers should be required. "The justification for the project is further weakened by the proposed end use of the gas," the FPC declared, "by uncertainties as to the project's economic feasibility, and by its questionable effect upon the operations of Atlantic Seaboard, which to date appears to have rendered adequate service in this area."

Commissioner John B. Hussey dissented in the X-20 ruling because "all factors usually considered in determining public convenience and necessity have been satisfied . . ."

He also said that the courts and the FPC have previously held that the use of gas for boiler fuel for the generation of electricity to be sold to the public "is justified where the public convenience and necessity is otherwise justifiable." Commissioner Hussey understood that there was no evidence that there was any market for the gas on the Transco system except that furnished by Con Edison and that if Transco bought the gas in the field, it would sell it to Con Edison.

He said he also understood that there was no evidence that the granting of the X-20 service would in any way deprive any Transco

Operating personnel at Texas Gas Transmission Corp.'s Petersburg (Ind.) station hear Walworth Co.'s Hendrix Barnett describe safety precautions for disassembling a plug valve. This is just one stop in a two-a-day schedule Barnett followed in his two-week trek which covered 28 Texas Gas stations. Other trained sales engineers from Walworth have been presenting the practical instruction program to seven other gas pipelines. Walworth works with the gas companies' safety departments in setting up the sessions.

PERFORMANCE speaks louder and
clearer than the words of any language.
You can believe what you see!
Crose is a magic word in far off lands.
It's a word that bridges the gap
between language and custom, because
on pipeline construction equipment
Crose not only stands for but also
demonstrates top performance
under roughest, toughest conditions.

FOR THE BEST, USE CROSE — ANYWHERE!

WORLD

LEADER IN PIPELINE

CONSTRUCTION

EQUIPMENT

MANUFACTURING COMPANY, INC.
2765 DAWSON ROAD PHONE WEBSTER 6-2171
TULSA, OKLAHOMA • BRANCH OFFICES: HOUSTON
• DENVER • ELIZABETH, N. J. • IN CANADA:
CROSE-CURRAN LTD., EDMONTON, ALBERTA

In the Centennial Year of the American Petroleum Industry, Transco is investing $100,000,000 in the pipeline system that carries Texas and Louisiana natural gas to the markets where the most people are.
TRANSCONTINENTAL
GAS PIPE LINE CORPORATION

customer of any needed service. "But, in fact," he said, "the evidence shows that Transco would have adequate pipeline capacity available for all of the services which it proposes to render, including all services to its other customers for which it now has a market."

SoCounties wants producer to go through channels

Before Richfield Oil Corp. builds a gas transmission pipeline to render boiler fuel service to Southern California Edison Co., Southern Counties Gas Co. wants it to obtain a certificate of convenience and necessity from the California PUC.

Southern Counties believes that the sale of gas for exclusive boiler use would have a seriously detrimental impact on the availability of supply and cost of serving gas to its customers in central and southern California.

"The service which Richfield proposes . . . would be that of a 'gas corporation' as defined in the California Public Utilites Act," said a gas company spokesman. "Therefore the gas company contends that Richfield must seek a certificate . . . for this project . . .

". . . The gas company is required to meet the tests of public convenience and necessity in connection with any pipeline operations of its own, and holds that the projected Richfield pipeline must be required to meet the same tests."

The spokesman went on to say that the gas company is prepared to serve the Edison plant under conditions compatible with the interests of other gas customers, and has been, and now is, in active negotiations with Edison to furnish such service.

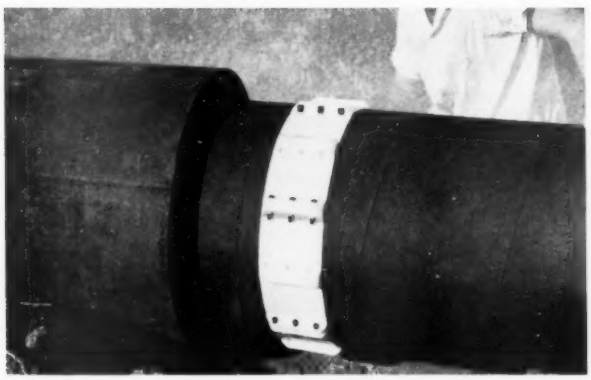
Mich-Wis distributors make heating additions

Michigan Wisconsin Pipe Line Co., Detroit, is to supply sufficient natural gas to nine of its distribution company customers to enable them to attach 30,957 additional space-heating customers (Dockets G-13246 et al).

The revision of gas allocations increases the number of space heating customers of these companies: Iowa Southern Utilities Co., Centerville, 568; Michigan Gas & Electric Co., Three Rivers, 996; Michigan Gas Utilities, Coldwater, 1468; Milwaukee Gas Light Co., 15,454; St. Joseph (Mo.) Light & Power

the right combination

FOR PIPELINES IN CASINGS . . .



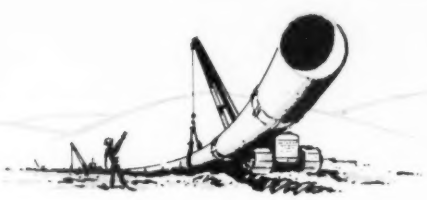
WmSON M-2 PLASTIC THINsulator . . . Complete Size Range

The WmSON M-2 thinsulator is made of tough *resilient* plastic which resists cracking or breaking under extreme abuse. This resiliency serves to absorb shock when encountering obstructions inside casing. The M-2 is *tough* . . . bend it . . . its plastic memory returns it to its original shape. Shipped in *one piece* for fast, easy installation . . . extra points of adjustment to fit bare or coated pipe. **There's a WmSON insulator for every pipeline-casing combination and condition.**

The Improved TYPE "Z" WmSEAL CASING BUSHING

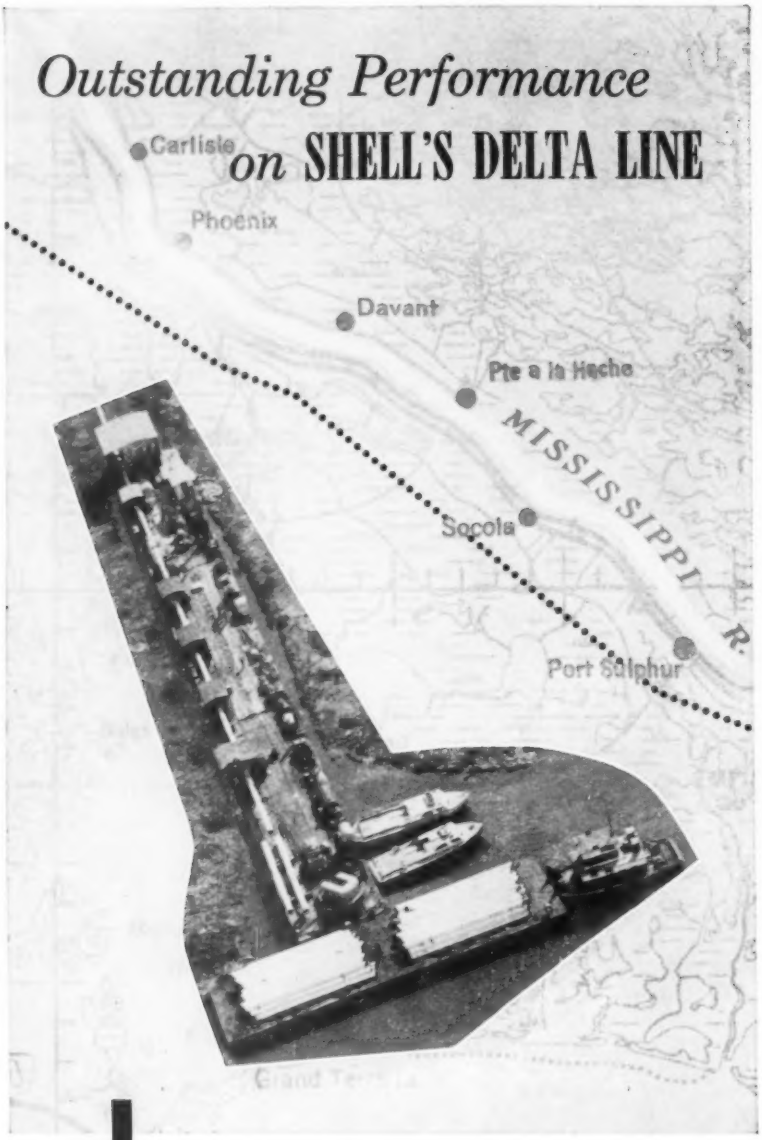
For a *real* seal that lasts . . . the Type "Z" WmSEAL Casing Bushing for any pipeline-casing combination. Constructed in one solid ring, the Type "Z" is easy to install . . . fastens securely with all-stainless steel clamps. Non-skid, long-gripping area anchors the bushing to the casing. *Tough* . . . and more flexible, the Type "Z" withstands weight of backfill dirt, without any shield. Extra thick shoulder prevents the edge of the casing from cutting through the bushing. **(For 2" pipe and larger). A perfect partner for WmSON insulators.**

SEE OUR EXHIBIT INTERNATIONAL PETROLEUM EXPOSITION
May 14-23 • 1959 • Tulsa, Oklahoma



T. D. Williamson, Inc.
P. O. BOX 40 TULSA 2, OKLAHOMA

REPRESENTATIVES: HOUSTON • AMARILLO • PLAINFIELD, N. J. • JOLIET, ILL. • LONG BEACH • SAN FRANCISCO • BARTLESVILLE, OKLA. • SEATTLE • SALT LAKE CITY • WEST MONROE, LA. • COLUMBUS, OHIO • EDMONTON • TORONTO • VANCOUVER • BUENOS AIRES • MONTERREY AND MEXICO CITY • CABIMAS, ZULIA, VENEZUELA • DURBAN, NATAL, S. AFRICA • PARIS • SYDNEY, AUSTRALIA • ROME, ITALY • MADRID, SPAIN • FRANKFURT MAIN, GERMANY



Houston Contracting's skilled crews and unequalled experience in the marshlands have made "ahead of schedule" routine. With three Houston spreads on the Shell Pipe Line job pictured above, nothing short of two well-placed hurricanes could have prevented another *ahead of schedule* completion.

HOUSTON CONTRACTING COMPANY

Laurence H. Favrot
R. P. Gregory
H. J. Muckley
Geo. A. Peterkin

2807 BUFFALO SPEEDWAY
HOUSTON 6, TEXAS

OIL • GAS • PRODUCTS • WATER PIPELINES

102

Co., 385; Wisconsin Natural Gas Co., 6100; Wisconsin Public Service Corp., 3863; Wisconsin Michigan Power Co., 236; and Wisconsin Power & Light Co., 1887.

Using an annual consumption factor estimated at 162 Mcf, the presiding examiner set the total annual volume of gas required for the 30,957 customers at 5 billion cu ft.

Michigan Wisconsin also was directed to deliver 58 MMcf annually to Northern Illinois Gas Co. for resale in Earlville, Ill. Space heating attachments were limited to not more than 227. The examiner denied a request from the City of Bethany, Mo., for gas service, but ordered Michigan Wisconsin to temporarily reserve some 254.6 MMcf on an annual basis, pending an opportunity afforded the city to overcome deficiencies in its showing.

The proceeding arose from a filing by Michigan Wisconsin to increase its system capacity to take 40 MMcf daily from the Laverne field, Harper county, Okla. In June 1958, an FPC presiding examiner okayed the construction of a major portion of the proposed facilities. The FPC adopted his decision, leaving the allocation of the additional gas and construction of the remainder of the facilities as the subject of further hearings. The addition of the 40 MMcf daily from the Laverne field brings Michigan Wisconsin's annual salable capacity to 158.2 billion cu ft.

Michigan Wisconsin planned to deliver 10 MMcf daily to its affiliate, Michigan Consolidated Gas Co., and the balance (30 MMcf) to its other customers. The presiding examiner agreed with the FPC staff contention that Michigan Consolidated's needs were not as pressing as those of other customers and did not allocate any additional gas to Michigan Consolidated.

Michigan Wisconsin also was authorized to construct 25.3 miles of 12¾-in. loops and a 1200-hp compressor station in Wisconsin at an estimated $1.4 million. The company's proposal to build additional compressor capacity costing $1.1 million was denied by the examiner. He said the company has not as yet shown that it has a firm annual gas supply sufficient to warrant these facilities.

FPC puts 13.3-cent limit on Bell Lake field gas

As long as the initial rate doesn't exceed 13.3 cents per Mcf,

View showing Roskote Mastic being applied mechanically to a portion of Oklahoma Pipeline Constructors, Ltd. spread. Following minor modifications to the hot dope machine shown, an 8-man dope crew averaged 10,000 to 12,000 feet per day. Only one supply kettle was necessary, as Roskote is applied cold.

Roskote Applied Cold with Line Travel Equipment on Trans-Canada 30 Inch

Over rough terrain, with a right of way that crossed solid granite, muskeg, swamp and glacial till, and working under adverse weather conditions, the world's longest and most difficult pipeline construction — Trans-Canada Pipe Lines, Ltd. — has been completed.

One contributing factor in the success of this construction was the adaptation of standard line travel dope machines for the easy application of Roskote cold mastic. This combination of Roskote Mastic and modified line travel machines made possible the coating of ten to twelve thousand feet per day of 30-inch piping on the downstream side of the compressor stations.

Contractors* were able to carry on the coating operation with an 8-man dope crew, using only one supply kettle, requiring no heating fuel and thereby eliminating toxic fumes and fire hazard.

*Contractors on Trans-Canada who applied Roskote by line travel equipment:
Morrison-Shivers, Ltd., Majestic Contractors, Ltd., B. C. Rivers Construction, Ltd., Dutton-Williams Brothers, Ltd. and Oklahoma Pipeline Constructors, Ltd.

ROYSTON LABORATORIES, Inc.
Blawnox, Pittsburgh 38, Pa.
A LEADER IN THE FIELD OF INDUSTRIAL COATINGS FOR CORROSION CONTROL
ATLANTA • CHICAGO • HOUSTON
PHILADELPHIA • SAN DIEGO • TULSA

ROSKOTE

G4

ROYSTON LABORATORIES, Inc.
Pittsburgh 38, Pa.

Please send me complete information about the economics and application of cold-applied Roskote Mastic with line travel equipment.

Name .....

Company .....

Address .....

City ..... Zone ..... State .....

four independent producers can sell gas from New Mexico's Bell Lake field to El Paso Natural Gas Co. (Docket G-13453, et al). This is in lieu of the proposed 16-cent rate.

Involved in the project is 50 MMcf of gas daily. El Paso will spend $780,000 on facilities to receive the gas.

In ruling on the rate question, Presiding Examiner William J. Costello said the record contained no showing "that the public interest requires that this sale should be certificated at 16 cents . . . or 2.65 cents . . . higher than El Paso would pay to any of its other suppliers in the Permian Basin . . ."

He said that while El Paso had shown that this gas is highly desirable and would be of great benefit to its system, the company had not proved that the premium it wishes to pay "has any ascertainable relationship to that extra value" of the gas.

Examiner Costello also pointed out that while the proposed sale at 16 cents per Mcf would have no noticeable immediate effect on El Paso's resale rates, there was room "for serious belief" that El Paso's other suppliers could and would assert contract rights which could have the effect of ultimately increasing the company's purchased gas costs by $17 million to $35 million annually.

Coal Interests win a point

In response to coal interest objections, FPC has modified a decision by one of its examiners. The decision authorized United Gas Pipe Line Co. to construct pipeline facilities—under a budget-type application—which would enable it to make direct industrial sales of natural gas (Docket G-15006).

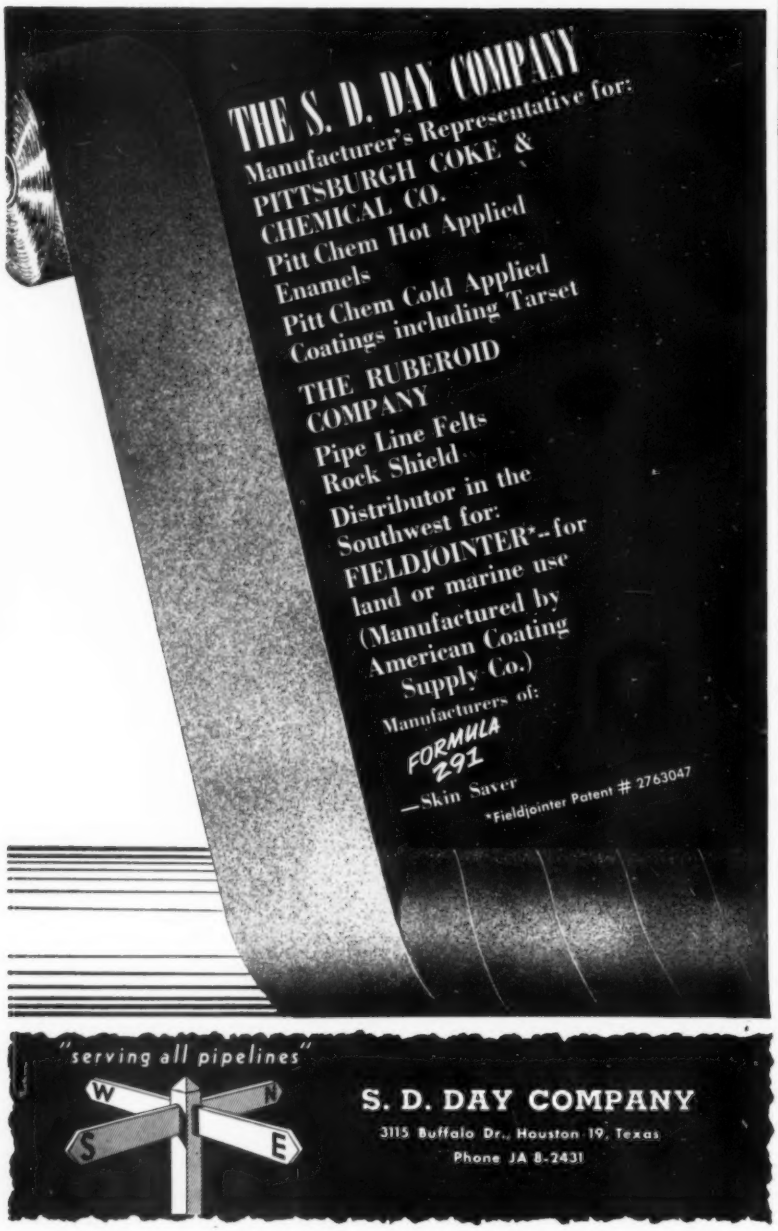
The FPC said the primary objection of the coal interests appeared to be "the possible destruction of future potential markets for coal" if any of United's presently unknown customers should use the gas as boiler fuel for the generation of electricity. To meet this objection, FPC modified the examiner's decision to include a condition prohibiting sales for use as boiler fuel in generating electricity, thus requiring United to make specific individual application if sales of this type should be contemplated.

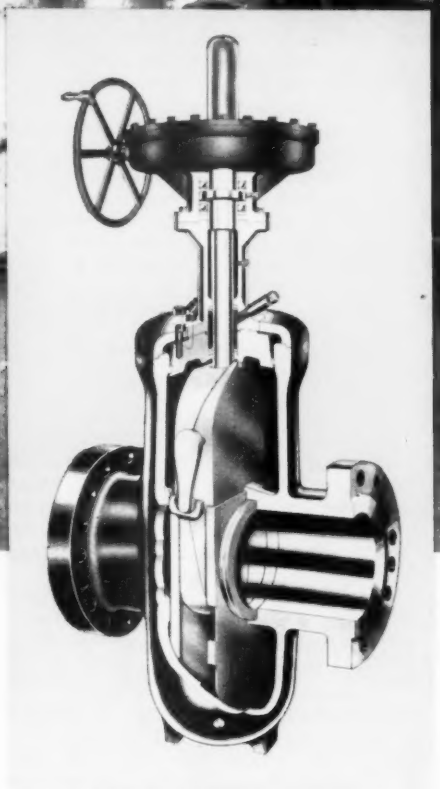
Final okay given TGT; side issues covered

Tennessee Gas Transmission Co.'s $169.3 million construction plan—which would increase average system delivery capacity by 405.6 MMcf per day—has a permanent certificate from the FPC (Docket G-11107). The FPC's order also dealt with several major controversial side issues covering types of service to be rendered through the new facilities.

The commission recommended that Tennessee examine its system operations and the service it renders, and to include in its next major certificate application a firm proposal for the full incorporation of its underground storage facilities into the overall operation of its system.

The FPC said TGT should develop a new service, possibly similar to the one it provides in its New York zone, for the New England states to supplant the present peak service for which a permanent certificate was denied in the commission's order. Tennessee was asked to submit such a plan by March 1. If a solution couldn't be found by then, it was to submit an





Leverlock* Gate Valves — A W-K-M Exclusive

W-K-M Pipeline Valves open **free** and close **easy** against any pressure within their rating. An exclusive centralizing mechanism—found only in W-K-M Leverlock Valves—positively holds the gate and segment assembly in a retracted position so that it will move freely between the seats when the valve is being opened or closed.

When the gate and segment reach the fully open or fully closed position—and only then—the centralizing mechanism releases to permit the gate and segment to expand and seat tightly against the upstream and downstream seats.

On Hand

Order 2-inch through 12-inch sizes from your supply store. Larger sizes to 34-inch available on special order from factory. Sizes 6-inch and larger are Leverlock Valves. ASA 300 pounds to ASA 1500 pounds.

*Trademark of ACF Industries, Inc.

The W-K-M® Through-Conduit Gate Valve is your valve

W-K-M's creative engineering designed this valve to solve *your* pipeline valve problems. It has been produced to meet your specifications for strength, long life and economy. Before it reaches you, it will have undergone rigorous and thorough testing.

That's why field men recommend the W-K-M Through-Conduit Gate Valve, why engineers specify its use. Its reputation inspires confidence—its dependability has been proved in service throughout the world.

It's *your* valve; specify and use it.

A Product of W-K-M's *Creative Engineering*

WRITE FOR CATALOG 300

W-K-M

DIVISION OF ACF INDUSTRIES INCORPORATED
P. O. BOX 2117 HOUSTON, TEXAS
Export Office: 45 ROCKEFELLER PLAZA, NEW YORK, N. Y.

5818

interim plan by April 1.

Tennessee now supplies gas, under temporary authorization, to its New England customers under a peak service arrangement. The company wanted the peak service arrangement to become permanent, but this was denied. However, FPC permitted TGT to continue the temporary service for the current winter.

The FPC declared that the record was inadequate to determine the proper rate for the permanent service, and said Tennessee had failed to sustain the authorization of future sales of peak service gas on the terms and conditions proposed.

Another major issue in the case was Tennessee's proposal to cancel its precedent service agreements with four subsidiaries of the Consolidated Natural Gas Co. In the face of uncertainties resulting from the Memphis decision, TGT in February 1958 gave notice that it could no longer continue to remain contractually obligated to proceed. Its substitute agreements were objected to by the Consolidated companies. However, the Supreme Court's reversal of the Memphis decision has effectively removed the obstacles and uncertainties. Tennessee is now willing to contract for all service proposed in its application and has made an offer to the Consolidated group to reaffirm and reinstate the service agreements. It appears that Consolidated is agreeable to proceed on this basis.

Still another major issue in the case was Tennessee's seller's option service. The FPC said that while it was authorizing the facilities necessary for this service, TGT would be required to file applicable rate schedules revised to reflect the addition of the new facilities. If TGT chooses to convert its seller's option service to contract demand service, applications must be filed within 90 days. Under the seller's option contracts, Tennessee has no daily obligation to deliver, but does have an annual delivery obligation. This service previously had been rendered through off-peak capacity.

Stay issued in allocation of Panhandle's gas

The FPC granted a stay of its order permitting Panhandle Eastern Pipe Line Co. to abandon gas sales to Michigan Consolidated Gas Co. The stay pends determination of the "proper" allocation of the soon-to-be-available gas. Hearings are slated for June 16.

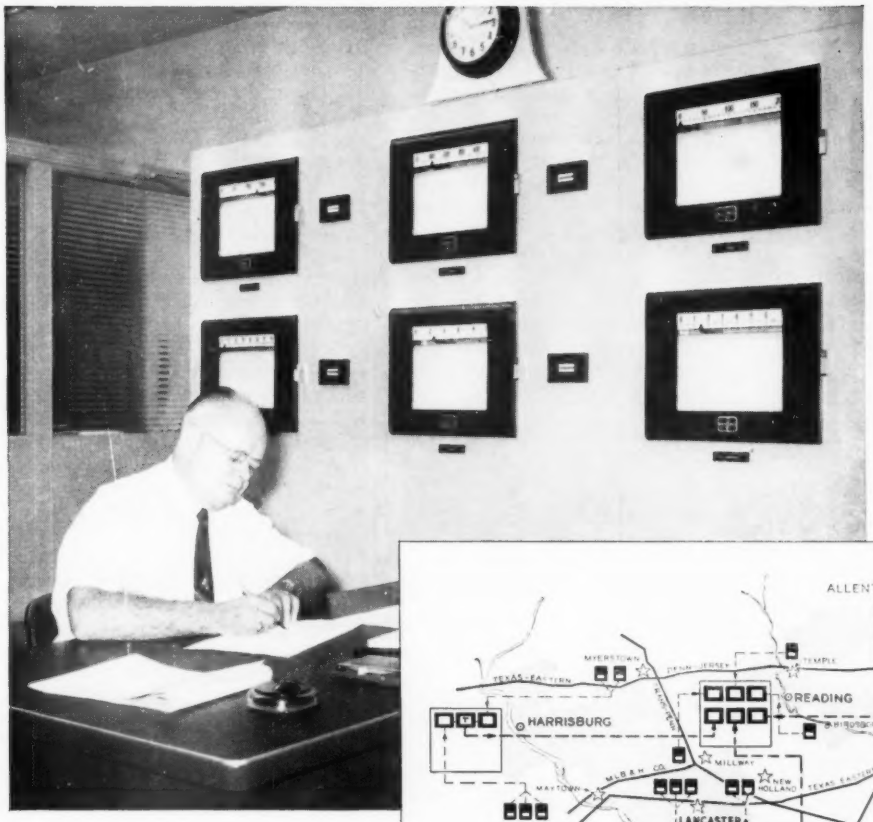
At the same time, the commission denied applications for rehearing which had been filed following its Dec. 19 order authorizing the abandonment. Also rejected was Panhandle's recently submitted plan for allocation of the gas.

The FPC's Dec. 19 order permitted Panhandle to stop service March 15, but required the company to submit an allocation plan within 30 days. Panhandle supplies 127 MMcf of gas per day to Mich Con, with 125 MMcf going to the Detroit area and 2 MMcf to Ann Arbor. The abandonment order covered the entire delivery.

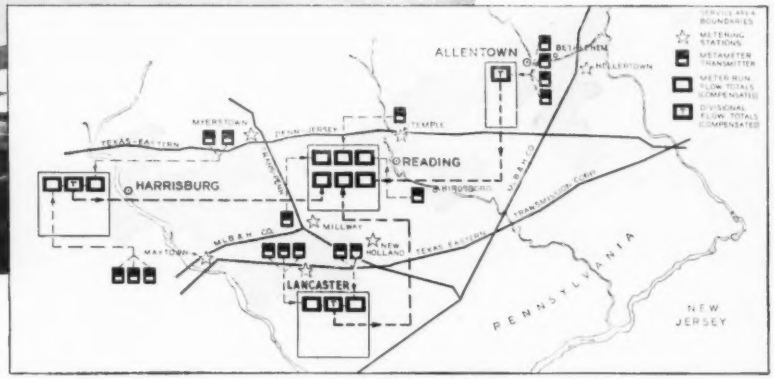
The FPC said that Panhandle's Jan. 19 allocation plan was similar to the one presented at the hearings on its abandonment proposal, and was not satisfactory. Michigan on Jan. 26 filed a proposed settlement. But, the FPC said it was not acceptable to other parties in the proceeding and "is otherwise inconsistent with our order."

In its Dec. 19 order, the FPC concluded that Mich Con's affiliate, American Louisiana Pipe Line Co., would have enough unallocated system capacity to replace the 127

PROVED BY MILES & MILES & MILES &



THE BRISTOL METAMETER* computer at United Gas Improvement Company continuously monitors this gas distribution network, automatically totalizes and corrects flow, and transmits results to central dispatching office at Reading, Pa.
*T. M. Reg. U. S. Pat. Off.



BRAIN 60 MILES LONG

computes for this dispatcher

Bristol computing telemeters give gas dispatcher instant, continuous, fully-corrected gas flow values

The instruments you see above are the readout end of a new Bristol computing telemeter system. They're installed at the Reading, Pa., headquarters of United Gas Improvement Company, whose natural gas distribution network serves the areas around Reading, Harrisburg, Lancaster, and Allentown, Pa. (See map.)

In seconds, the Bristol computing telemeters provide the gas dispatcher with integrated total flow values it used to take him hours to get—if at all. And the readings are fully and automatically corrected for factors like pressure, temperature, supercompressability and specific gravity. In fact, the continuously computed readings have generally agreed with the gas vendor's billing meter totals far more closely than the specified 1.5% accuracy.

Find out how a Bristol computing telemetering system can eliminate slide-rule work, information delays and uncertainties from your distribution system for natural gas or any other fluid, whether it covers miles or only a few hundred yards. Write: The Bristol Company, 119 Bristol Rd., Waterbury 20, Conn.

BRISTOL TRAIL-BLAZERS IN PROCESS AUTOMATION

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

MMcf from Panhandle. Michigan now receives gas from American Louisiana and Michigan Wisconsin Pipe Line Co., another affiliate, as well as from Panhandle.

After reviewing pleas for rehearing, FPC said that no considerations had been presented which "alter our conclusion that the public interest not only 'permits,' within the language of the statute, but favors the proposed abandonment."

While the contention may be true that it had never before permitted an abandonment of service over the protests of the buyer, the FPC said "here we have a peculiar situation where one of two great rival natural gas systems is required to serve the other."

Previously, the commission had been unwilling to permit the abandonment because of the shortage of gas supplies. Now, it continued, because of American Louisiana's increased capacity and the availability of gas reserved in another proceeding, "abandonment has become feasible, and it is our opinion that each system will more efficiently procure gas supplies and serve its own customers if separated from the other." Viewing the problem in this way, the FPC added, "it is not essential that the American Natural Gas System's gas resources precisely equal its requirements as long as they substantially do so, although we have found that these resources are indeed sufficient to meet present requirements."

Commissioner Arthur Kline filed a concurring statement and Commissioner William R. Connole dissented in a separate statement.

Commissioner Kline said that while he concurred in denying the rehearing, he personally preferred a partial abandonment only. The majority, he said, believed that the benefits which will accrue to the public by reason of the complete severance outweigh other aspects of the public interest. "I am of the opinion," he continued, "that the immediate hardship to gas consumers in the Detroit area, coupled with the fact that complete abandonment will leave the American Natural system only with enough gas to serve its existing customers and will not permit it to extend service to communities in its service area which have been waiting for years for the gas, makes it more in the public interest to authorize only a partial abandonment. . . ." However, he said the difference between himself and the majority was purely one of judgment and of how much weight should be accorded to the various factors affecting the public interest.

Commissioner Connole dissented from that part of the order that denied reconsideration "for the purpose of permitting us to examine the compromise plan of allocation proposed by Michigan Consolidated."

He said that while there probably were many defects in Mich Con's proposed settlement plan and that he did not unequivocably accept it, there are, on the other hand, "indisputable advantages." Pointing out that the plan was not before the FPC at the time it considered abandonment, he said that the proposal has received the support of many parties, both public and private.

"In my judgment," he said, "the record in this proceeding should be reopened, Michigan Consolidated and other parties supporting the proposed compromise settlement should be permitted an opportunity of justifying the settlement, and the final order should reflect careful consideration of the record as so expanded." He said he dissented

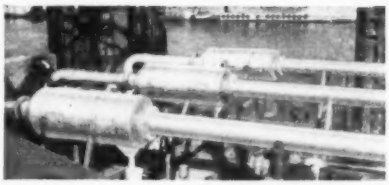
GAS PIPELINE COMPRESSOR STATION

MAXIM

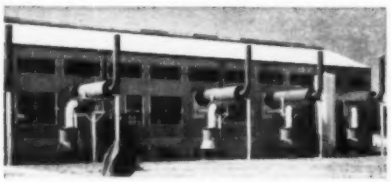
THE COMPLETE SOURCE OF

SILENCERS

For over 50 years, Maxim's main concern has been to engineer the finest silencing equipment possible. Maxim's complete line of silencers makes it possible to select precisely the kind and degree of noise control you need. Put Maxim engineers to work on your special problems, or send for latest bulletins.



OIL WELL DRILLING RIGS



OIL PUMPING STATIONS

Emhart Manufacturing Company
Maxim Division
Hartford 1, Connecticut

EMHART

Emhart Manufacturing Company, Maxim Division
Hartford 1, Connecticut 45

Please send me bulletins on Maxim Silencers for:

☐ Waste heat recovery
☐ Steam, air or gas discharges
☐ Jet engine exhaust and intake
☐ Internal combustion exhaust and intake
☐ Air compressor intakes and discharges
☐ Blower intakes and discharges

name

company

address

POTENTIAL

1. FABRICATION of all types of equipment (Fractionating Columns, Gas Columns, Pressure Vessels, Plate and Heavy Steel Work, Special Machines, Autoclaves, Shells, Bridge Girders) is performed to order, to specification.

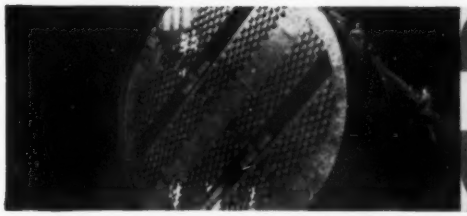
2. MACHINING—Fully equipped, flexible facilities for machining to close tolerances, regardless of product size or design.

3. STAINLESS—Separate, integrated shop for stainless fabrication protects against contamination by ordinary steel.

4. DELIVERY by rail, truck or inland, coastal or overseas waterway.

1 FABRICATION

2 MACHINING



3 STAINLESS

4 DELIVERY

Through integrated, efficient operation, Sun Ship can reduce costs, increase your POTENTIAL. Call for an estimator or representative.

Sun

SHIPBUILDING & DRY DOCK COMPANY

ON THE DELAWARE • SINCE 1916 • CHESTER, PA.

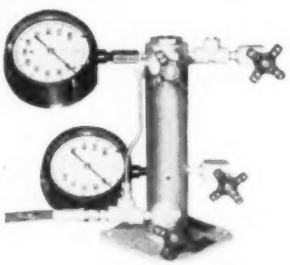
GARRETT
PRESSURE RELIEF
VALVES

REDUCE COSTLY
SHUT-DOWN TIME!

HERE'S HOW:

Without removing the valve body from the line, the set pressure and re-set pressure of a Garrett Relief Valve may be checked in a few minutes time. Using the small, light weight Garrett Test Fixture, pressure from bottled nitrogen or other source, and regular hand tools, pressures may be checked or changed by field personnel, without special training.

This is another feature of Garrett Relief Valves which adds to the safety and economy of your operations.



The Garrett Test Fixture is simple to use, light and easy to carry, and completely accurate in operation.

FOR COMPLETE INFORMATION, WRITE FOR CATALOG NO. RV-103-A

USI Garrett Oil Tools
Division U. S. Industries, Inc.
P. O. BOX 2427 • LONGVIEW, TEXAS

from the majority opinion because it renders that impossible.

He also indicated that the language of the objections made to Panhandle's proposed plan showed that at least as much time would be consumed in proceedings to allocate the gas, even without American Natural System or its customers as parties, as would be consumed if the proceedings were broad enough to include consideration of Mich Con's compromise offer.

Texas Gas, Texas Eastern plan construction

On file with FPC are joint applications by Texas Gas Transmission Corp. and Texas Eastern Transmission Corp. to spend $48.1 million on new and reactivated pipeline facilities.

Proposed facilities will enable Texas Gas to gather and transport up to 100 MMcf daily, on a firm basis, for Hope Natural Gas Co. Hope would purchase or produce the gas from fields in and off shore from Louisiana. Texas Gas would deliver the gas to Texas Eastern at their existing interconnection near Lebanon, Ohio.

Texas Eastern (Docket G-17420) would move the gas from Lebanon to Hope or an affiliate at existing points of delivery.

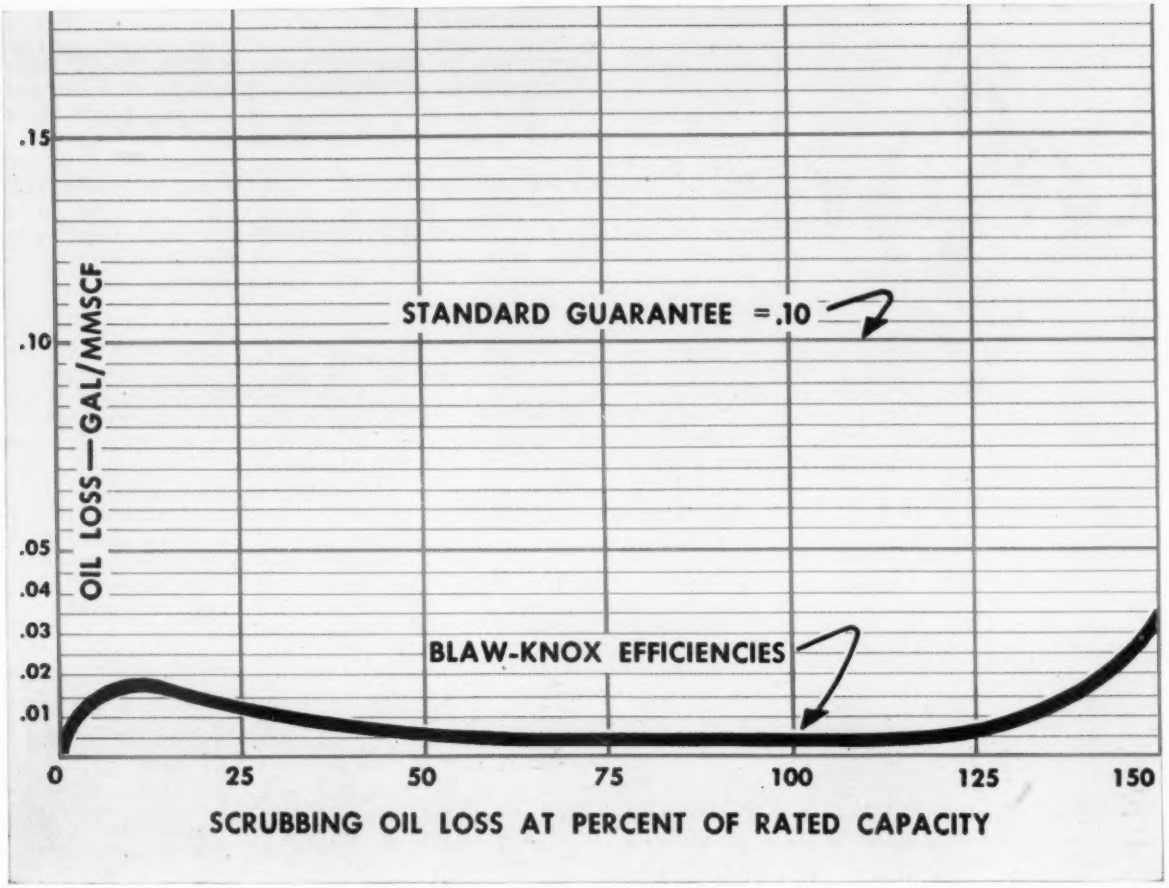
Texas Gas' plan (Docket G-17335) calls for about 245 miles of 30- and 26-in. loops along its system in Louisiana, Arkansas, Mississippi, Tennessee, Kentucky, Indiana, and Ohio. Also, 14,000 hp additions to existing stations and one new 1760-hp station, together with a 26-in. river crossing, meter stations, and appurtenance facilities. Texas Gas share of the cost: $39.6 million.

Texas Eastern wants to reactivate 189 miles of 20-in. line from Middletown, Ohio, to Moundsville, W. Va., and 12,500 hp in existing compressor capacity. This work, along with 3100 hp additions at existing compressor stations, will cost Texas Eastern about $2.3 million.

New offshore supply okayed for Transco

Transcontinental Gas Pipe Line Corp., Houston, has an FPC presiding examiner's approval of its plan to spend $2.1 million to receive offshore Louisiana gas from Superior Oil Co. (Docket G-16387 and 16380).

The presiding examiner denied



Now you can compare gas cleaner efficiencies with accuracy

Laboratory and field tests prove that the new Blaw-Knox Gas Cleaner has the best efficiencies at the widest range of gas flow. Three hundred individual tests plus six weeks of actual on-the-line field operation have been tabulated. The remarkable results are shown graphically in this illustration.

Through the entire range of the new Blaw-Knox Gas Cleaner the scrubbing oil loss at rated capacities is less than .02 gallons per million standard cubic feet of gas.

Accurate efficiencies of gas cleaners should be known before the decision to buy is made. Judge gas cleaners not only on how completely foreign particles are removed (Blaw-Knox can do this down to less than one micron), but also on how oil-free the downstream gas actually is.

BLAW-KNOX

BLAW-KNOX COMPANY

Buflovak Equipment Division

1547 Fillmore Avenue, Buffalo 11, New York

LOYALTY

and length of service are among the reasons

SOMERVILLE

crews have more desire to do the job right.

SOMERVILLE CONSTRUCTION CO.
Ada, Michigan
SIGN OF SATISFACTION
TRANSMISSION LINES
DISTRIBUTION SYSTEMS

requests by United Gas Improvement Co. and the New York PSC to condition the initial price of the gas at 17 cents per Mcf. Superior proposed an initial price of 21.4 cents per Mcf.

The intervenors, while contending the authorization should be conditioned as to initial price, the examiner said, made no evidential showing to establish what a new price should be or that the price agreed upon by the parties was unjust, unreasonable, etc. "Such a showing," he said, "is a prerequisite to a rate, or initial price, condition."

Total estimated reserves to be acquired from Superior approximate 1 trillion cu ft.

FPC accepts Colorado's $91 million filing

Colorado Interstate Gas Co.'s $91 million construction plan has been accepted for filing by the FPC and docketed, G-16904.

CIG will build a new 359-mile 20- and 34-in. line from the West Panhandle field of Texas to Denver, Colo. An 85.7-mile line is planned to tie in new reserves in Kansas, Oklahoma, and Wyoming. In addition, CIG will reverse the flow in its existing line between Denver and Green River, Wyo.; construct 155 miles of 34-in. line between Green River and Provo, Utah; and 32 miles of 6-in. transmission line in Colorado.

Colorado Interstate plans to sell (see GAS, September 1958, p. 112, and January 1959, p. 103) up to 239 MMcf daily to El Paso Natural Gas Co. near Green River. CIG also would transport for El Paso up to 478 MMcf daily from Green River to Provo. The additional gas would be purchased by El Paso from Pacific Northwest Pipeline Corp. El Paso will sell most of the gas to Pacific Lighting Corp. Eventually it will wind up in the Los Angeles area.

Other facilities covered: nine new compressor stations totaling 45,980 hp, 24,600-hp additions to four existing stations, retirement of 275 miles of line between Bivins, Texas, and Denver and seven compressor stations with a total of 27,115 hp.

GAS • Pipeline Notes

Some 65 miles of 16-in. line are being plastic coated—internally—by Pipecote Service Corp., Tulsa. The lines run from Hobbs, N. M., to Kermit, Texas. The Pipelife process of coating the pipe in place is being used.

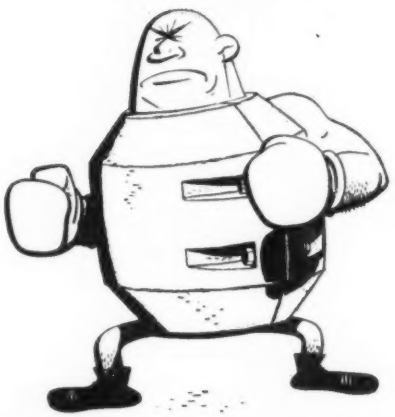
Garrett Oil Tools, Longview, Texas, has two new agents handling its relief valves, diaphragm control valves, and industrial and pipeline equipment. They are Belen-Lynn McGuffy Co. Ltd., Calgary, covering the Canadian provinces of Alberta, Saskatchewan and Manitoba, and the Fort St. John area of British Columbia; and Hudson Engineering Co., Birmingham, covering Alabama, western Florida, southern Mississippi and central Tennessee.

Colorado Interstate Gas Co. has offered a refund of $4.7 million principal and interest through Dec. 31, 1958, to its wholesale customers and a reduction of about 15 per cent in future rates in settlement of its fourth rate increase, in effect since Feb. 5, 1958. An additional amount would be refunded from the period from Jan. 1, 1959, to the date of settlement. CIG president W. E. Mueller said the 15 per cent reduction would amount to about $5.7 million annually.

Undisputed Champion!

Allan Edwards

HEAVYWEIGHT
RIVERWEIGHTS
PUT YOUR
PIPELINE



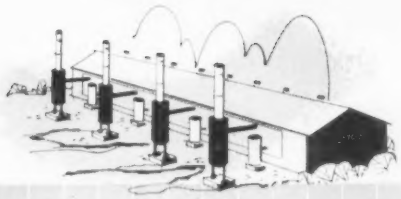
. . . DOWN FOR KEEPS

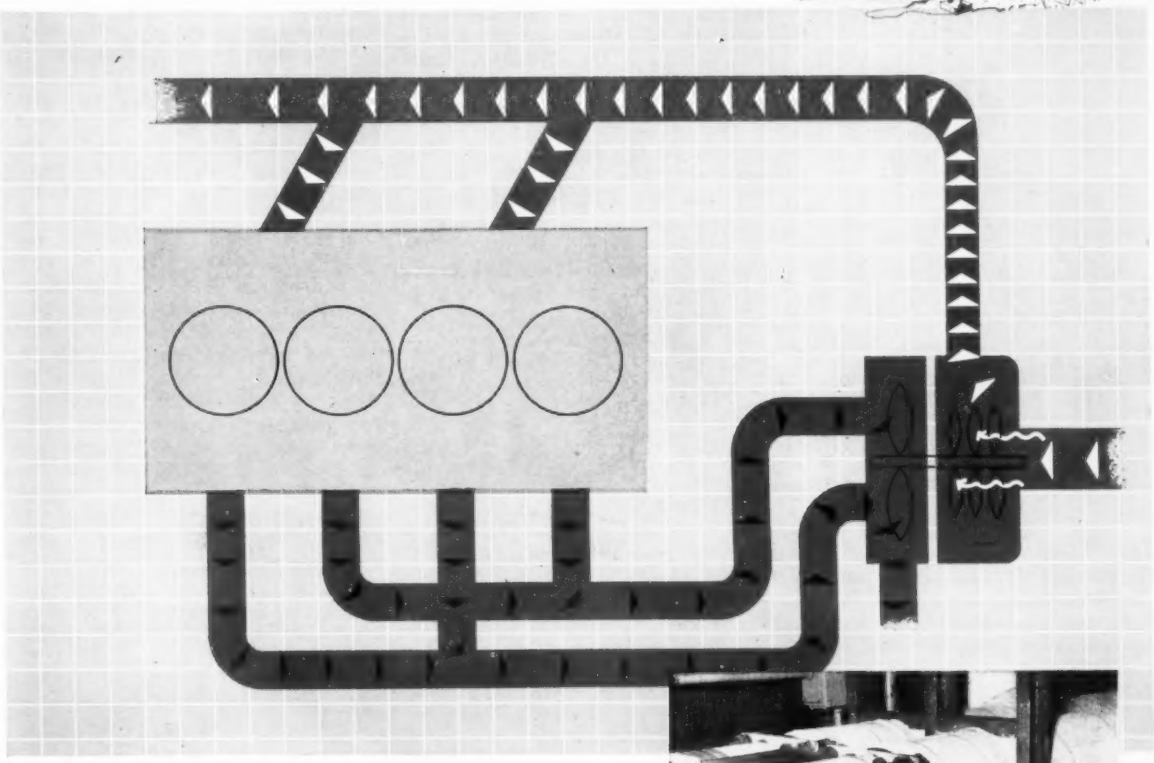
Allan Edwards, Inc., is the nation's oldest manufacturer of concrete river-weights. Weights are carefully designed and constructed to meet individual requirements. Weights can be constructed at your jobsite if tonnage warrants. Other fine Allan Edwards pipeline specialty products include . . .
WELDING SLEEVES • HALF SOLES • MARKER POSTS

Allan Edwards, Inc.
2445 S. Jackson—P. O. Box 7218, Tulsa, Oklahoma

Flexonics

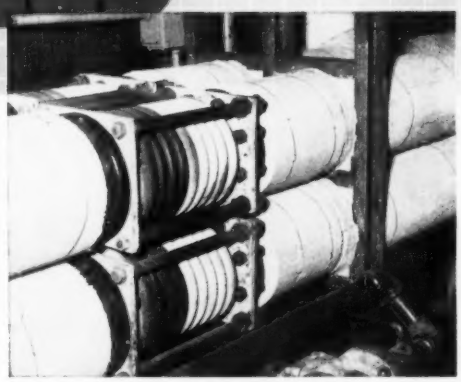
has the engineering experience to help you solve exhaust expansion problems when you turbocharge compressors





Here's a lively subject – *increasing gas pipeline capacity by turbocharging existing compressors in the field.* If you want the answers to the expansion problems that arise when the exhaust piping becomes an integral part of the operating loop, call on FLEXONICS engineers. They have the *specific* experience in this field that can mean actual dollar savings to you.

Write today for your free copy of this easy-to-read report. It tells you the dollars-and-cents facts that led an important pipeline company to a complete turbocharging program.



Special-design FLEXONICS Expansion Joints in the exhaust piping of a newly turbocharged compressor station.

Member Expansion Joint Manufacturers Association

EJ-250

TOMORROW'S ENGINEERING TODAY

Flexonics

EXPANSION JOINTS

FLEXONICS CORPORATION · 1421 SOUTH THIRD AVENUE · MAYWOOD, ILLINOIS

Divisions

INDUSTRIAL HOSE · EXPANSION JOINT · BELLOWS · AERONAUTICAL · AUTOMOTIVE

Flexonics Research Laboratories, Elgin, Illinois

In Canada: Flexonics Corporation of Canada, Limited, Brampton, Ontario

Transmitting

From its office in Gainesville, the Georgia Gas Company controls an Ingersoll-Rand SVG gas-engine compressor 15 miles away by microwave signals. This control panel indicates operating conditions, and contains con-

trols which are linked by the microwave transmitter (at its left) to a receiver and control panel at the compressor station 15 miles away (see opposite page).

Ingersoll-Rand

6-894

pipeline people • *Cont'd.*

from page 114

SIMPSON, honorary chairman of the National Bank of Commerce, has become TGT's first director-emeritus. He has been a director for 10 years.

CHARLES PENNYPACKER SMITH has been elected vice president and manager of Alberta & Southern Gas Co. Ltd., the Canadian firm organized to obtain gas supplies for transmission to the California market. He succeeds J. K. HORTON, who has become president of Southern California Edison Co. Smith also was elected to the A&S board. He has been manager of A&S operations since 1957. Joining Pacific Gas & Electric in 1937, Smith established the gas department's weather forecasting service. In 1943 he was named chief gas dispatcher, and in 1954 became supervising gas supply engineer. He now headquarters in Calgary.

JOSEPH LABARBERA has been promoted from manager of production to vice president of manufacturing of the J. B. Beaird Co., Shreveport. LaBarbera joined Beaird as assistant plant superintendent in 1955 and was promoted to manager of production in 1957. In his new capacity, he will be responsible for all manufacturing operations of the company's three plants in Shreveport, Clinton, Iowa; and Stockton, Calif.

ROBERT D. SLACK has been appointed sales representative for Midwestern Pipe Line Products Co., Tulsa. From his Des Moines headquarters, Slack will cover the Iowa, Nebraska, Kansas, and Missouri area.

Presidents of Tennessee Gas Transmission Co.'s three new operating divisions have announced their officers are responsibilities of each. They are: Tennessee Gas Pipeline Co.—L. W. A. CAMPBELL, vice president in charge of engineering; T. K. DAVIS, vice president responsible for compressor, gas control and measurement operations; J. L. PARRISH, vice president in charge of pipeline construction research, radio, and corrosion prevention; O. H. SIMONDS JR., vice president supervising sales and planning; B. J. WHITLEY, vice president in charge of pipeline operation, maintenance, and right-of-way matters. Tennessee Gas & Oil Co.—S. C. OLIPHANT, senior vice president directing overseas operations; W. E. SCOTT, senior vice president in charge of U. S. and Canadian operations; J. SPENCER COLLINS, vice president heading up the exploration group of the Houston headquarters staff, reporting to Scott; S. P. KING, vice president assisting Oliphant in supervision of foreign operations; O. W. WARD, vice president heading up the Canadian operating division and reporting to Scott; A. R. WEST, vice president, supervising the production group of the Houston headquarters staff, reporting to Scott. Bay Petroleum Co.—L. L. LEABO, vice president, directing marketing activities; GEORGE H. MEASON, vice president in charge of crude oil refining operations; K. G. PEARCE, vice president, supervising natural gas processing and the production of liquefiable petroleum gases.

ROBERT D. BUTLER has been promoted to sales manager, plug valves for W-K-M, a division of ACF Industries Inc., Houston. He has been assistant to the sales manager for the past year.

CHARLES R. HETHERINGTON has resigned as an executive of Westcoast Transmission Co. Ltd. and Pacific Petroleums Ltd., Calgary. He has served as director and managing director of Pacific and vice president of Westcoast. Hetherington will enter private consulting practice.

Harold Burrow
Tennessee

C. W. Hamilton
Tennessee

H. M. Lovett
Tennessee

Robert Slack
Midwestern

The IR gas-engine compressors that "THINK FOR THEMSELVES" also respond to

"TELEPATHY"

...Georgia Gas Company's new booster station is controlled by microwave from 15 miles away

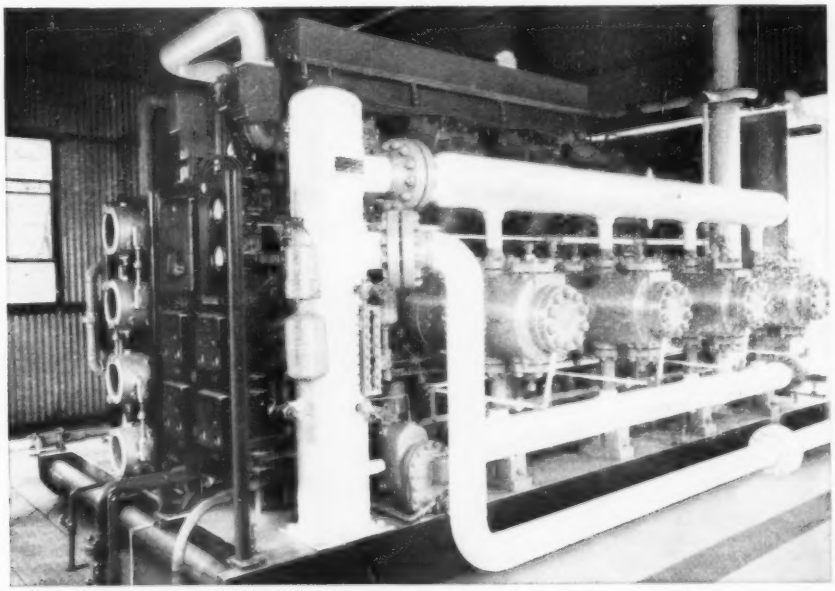
At Georgia Gas Company's office in downtown Gainesville, a man turns a knob on a control panel and a radio signal is beamed from a tower outside the building. Fifteen miles away, a 440-hp Ingersoll-Rand SVG gas-engine compressor plant starts itself, brings itself up to speed, and puts itself on stream delivering gas to Georgia homes and businesses. All the time it is running, the unit is monitoring its own operation and protecting itself from harm.

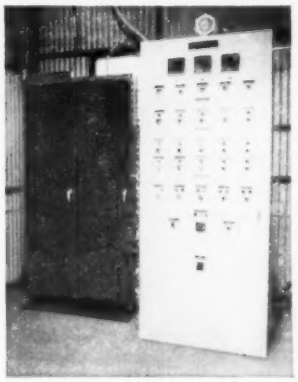
This installation is only a sample of the new things happening in the pipeline field, and this SVG is only a part of the Ingersoll-Rand compressor family that is meeting the challenge of new developments. I-R 4-cycle V-angle engine-compressors are ideal for automated and remote-control installations, due to inherently greater operating *stability* through a wide range of speeds and loads.

Ingersoll-Rand has supplied millions of horsepower of heavy-duty compressors for every possible service, and builds many types of other equipment for the pipeline industry. Call your I-R representative now for more information.

Receiving

Radio signals received by this panel are converted to impulses which start or stop the Ingersoll-Rand SVG gas-engine compressor shown at left below. With the panel, the compressor automatically monitors its operation—it takes its own temperatures, gauges its pressures, watches its lubrication and protects itself from damage. And if any abnormal condition occurs, it warns its operator and shuts itself down.





Ingersoll-Rand

6-894

11 BROADWAY, NEW YORK 4, N.Y.

Only I-R compressors have CHANNEL VALVES

Known for high efficiency, quiet operation and exceptional durability. Entirely different. Each valve is a combination of straight-lifting stainless-steel channels and leaf springs, with trapped-air spaces which cushion action, prevent impact.

— INDEX TO ADVERTISERS —

Adams Pipe Repair Products 90
Aerotec Corp. ..... —
Allied Chemicals, Plastics & Coal Chemicals Div. ..... —
American Cast Iron Pipe Co. ..... —
American Meter Co. Front Cover, 48, 102, 106
American Meter Co., Reliance Regulator Div. ..... Second Cover
American Recording Chart Co. ..... —
American-Standard 109
Aqua Survey & Instrument Co. 114
Arkla Air Conditioning Corp. ..... —

Barber-Greene Co. 43
Baso Inc. 38
Berry Hydraulics Div., Oliver-Tyrone Corp. 42
Bethlehem Steel Co. ..... —
Bilco Co. 111
Black, Sivalls & Bryson, Inc., ... Third Cover
Blaw-Knox Co. 155
Bonney Forge & Tool Works 91
Bristol Co. 151
Browne Mfg. Co., Stewart R. ..... —
Bucyrus-Erie Co. ..... —
Burroughs Corp., ElectroData Div. 25
Busada Supply Co., Inc. 92
Byers Co., A. M. ..... —

Capitol Mfg. & Supply Co. 5
Cast Iron Pipe Research Assn. 26, 27
Cathodic Protection Service ..... —
Chaplin-Fulton Mfg. Co. 24
Chemtrol Corp. ..... —
Cleveland Trencher Co. 107
Connelly, Inc. 108
Cooper-Bessemer Corp. 138, 139
Coast Paint & Lacquer Co. 135
Cosa Corp. 90
Crose Mfg. Co., M. J. 143
Cutler-Hammer Inc. ..... —

Darling Valve & Manufacturing Co. 131
Davey Compressor Co. 85
Day Co., S. D. 148
Dollinger Corp. 36
Dover Corp., Peerless Mfg. Div. 113
Dresser Industries, Inc. ..... —
Clark Bros. Co. ..... —
Dresser Manufacturing Div. 100, 101
Roots-Connersville Blower Div. 41
Southwestern Industrial Electronics Div. ..... —

Eastman Chemical Products 35
Ebasco Services, Inc. 79
Edwards Inc., Allan 156
ElectroData Div., Burroughs Corp. 25
Electro Rust-Proofing Corp. ..... —
El Paso Natural Gas Co. ..... —
Emhart Manufacturing Co. Maxim Div. 152

Fisher Governor Co. 16, 32
Fisher Research Laboratory, Inc. 112
Flexonics Corp. 157
Ford Motor Co., Tractor & Implement Div. ..... —
Foxboro Co. 141

Gardiner Electronics Co. 110
Garrett Oil Tools, Inc. 154
General Controls ..... —
Goodrich Chemical Co., B. F. ..... —
Grabler Manufacturing Co. ..... —
Grayson Controls Div., Robertshaw-Fulton Controls Co. 13
Grove Valve & Regulator Co. 83

Hallen Construction Co., Inc. ..... —
Hammarlund Mfg. Co., Inc. ..... —
Handley-Brown Co. 7
Hardwick Stove Co. ..... —
Hays Manufacturing Co. 89
Heat & Power Co. Inc. 114
Hill, Hubbell Co. 39
Homestead Valve & Manufacturing Co. 81
Houston Contracting Co. 146

Industrial Polychemical Service ..... —
Ingersoll Rand Co. 158, 159
International Harvester Co. ..... —
International Petroleum Exposition ..... —

Jaeger Machine Co. 46
Jones & Laughlin Steel Corp. 126, 127

Ka-Mo Tools Dept., Kwik-Mix Co. 105
Koenig Iron Works Inc. 112
Kraloy Plastic Pipe Co., Inc. ..... —
Kwik-Mix Co., Ka-Mo Tools Dept. 105

Laclede Steel Co. 1
Ladish Co. ..... —
Lancaster Meter Parts Co. 86
Ledeen Manufacturing Co. 4
Lester Equipment Mfg. Co., Inc. ..... —
Lone Star Steel Co. 3

Maloney Co., F. H. 133
Marbon Chemical Div., Borg-Warner Corp. ..... —
Mavor-Kelly Co. ..... —
Maxim Div., Emhart Manufacturing Co. 152
Maxitrol Co. ..... —
May Products Inc. ..... —
McCabe-Powers Body Co. 33
Midwestern Pipe Line Products Co. ..... —
Minneapolis-Honeywell Regulator Co. ..... —
Motorola Communications & Electronics, Inc. 84
Mueller Co. 22, 23

National Tank Co. ..... —
National Tube Div., U. S. Steel Corp. ..... —
Natural Gas Odorizing Inc. ..... —
Naugatuck Chemical Div., U. S. Rubber Co. 31
Nordstrom Valve Div., Rockwell Manufacturing Co. 21
Norton-McMurray Manufacturing Co. 80
Norwalk Valve Co. ..... —

Oliver-Tyrone Corp., Berry Hydraulics Div. 42
Onan & Sons, Inc., D. W. 103
Oronite Chemical Co. ..... —

Parsons Co. 104
Peerless Manufacturing Co. ..... —
Peerless Mfg. Div., Dover Corp. 113
Perrault Equipment Co. 150
Philadelphia Gear Corp. ..... —
Pipe Line Service Corp. 137
Pittsburgh Coke & Chemical Co. ..... —
Polyken Products Div., Kendall Co. 18
Pritchard & Co., J. F. 34

Radiator Specialty Co. 110
Reed Manufacturing Co. 110
Regent-Jack Mfg. Co., Inc. ..... —
Reliance Regulator Div., American Meter Co. ..... Second Cover
Republic Steel Corp. ..... —
Reynolds Regulator Co. 88
Ridge Tool Co. 87
Robertshaw-Fulton Controls Co., Grayson Controls Div. 13
Thermostat Div. 37
Rockwell Manufacturing Co. Gas Products Div. ..... —
Instrument Div. 29
Nordstrom Valve Div. 21
Roots-Connersville Blower Div. Dresser Industries, Inc. 41
Royal McBee Corp. 30
Royston Laboratories Inc. 147

Safety Gas Main Stopper Co. 88
Seamless Rubber Co. ..... —
Sherman Products Inc. 9
Sheraton Corp. of America ..... —
Skinner Co., M. B. 47
Sloane Manufacturing Co. ..... —
Smith Corp., A. O. ..... —
Smith Manufacturing Co., A. P. ..... —
Somerville Construction Co. 156
Sooner-Boomer Mfg. Div. 93
Southern Cross Foresters 82
Southern Pipe Div., U. S. Industries ..... —
Sprague Meter Co. ..... Fourth Cover
Stafford Co., R. W. 114
Standard Electric Time Co. 40, 114
Standard Magnesium Corp. ..... —
Standard Pipeprotection, Inc. ..... —
Sun Shipbuilding & Dry Dock Co. 153
Superior Meter Co. 44

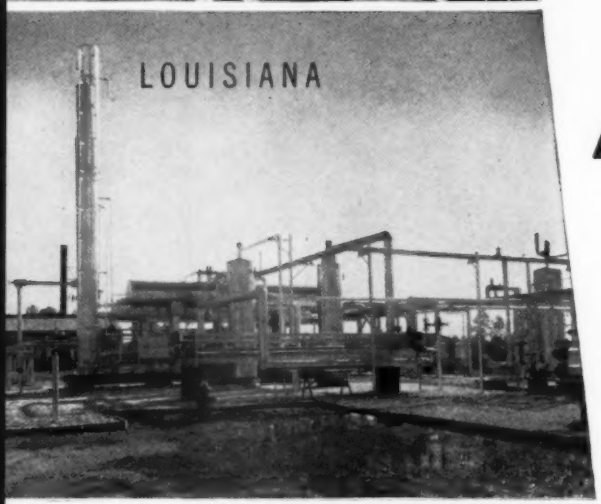
Tapecoat Co. ..... —
Taylor Forge & Pipe Works ..... —
Tennessee Gas Transmission Co. ..... —
Tex-Tube Inc. 14
Thermac Co. 20
Tinker & Rasor 112
Transcontinental Gas Pipe Line Corp. 144
Tube Turns Inc. ..... —

Union Malleable Mfg. Co. ..... —
Union Switch & Signal Div. Westinghouse Air Brake Co. 116
United Engineers & Constructors ..... —
U. S. Industries Garrett Oil Tools Inc. 154
Southern Pipe Div. ..... —
U. S. Pipe & Foundry Co. 28
U. S. Rubber Co., Naugatuck Chemical Div. 31
U. S. Steel Corp., National Tube Div. —
Universal Controls Corp. ..... —

Vermeer Manufacturing Co. 92
Vulcan Rubber Products, Inc. ..... —

Walworth Co. ..... —
Warren Petroleum Corp. 114
Western Plastics Corp. ..... —
Westinghouse Air Brake Co., Union Switch & Signal Div. 116
White-Rodgers Co. 45
Wilcolator Co. ..... —
Williams Pressure Service Co. ..... —
Williamson, Inc., T. D. 145
W-K-M Div., ACF Industries Inc. 149
Wood Co., John 10

Yardley Plastics Co. ..... —
Youngstown Sheet & Tube Co. ..... —



AMMONIA ABSORPTION REFRIGERATION

BS&B

. . . Today's Most Versatile And Economical Heavy Duty Artificial Refrigeration System For Every Basic Oilfield Application!

Entirely Self Operating. Automatically Adjusts To Load Changes.

Low Initial Cost. May Be Entirely Skid-Mounted Except Ammonia Reboiler. Outside Construction —No Buildings Required.

Low Cost Maintenance. Liquid Pump Is The Only Moving Part.

Operating Costs Vary In Direct Proportion To The Load.

Lower Operating Temperatures Do Not Materially Decrease Capacity.

Completely Closed System.

Oil Lubrication Eliminated. No Oil-Refrigerant Problem.

Vibration Free. No High Speed Reciprocating Machinery To Mount.

Experts Are Not Required To Operate And Maintain The Unit.

For more information of the applications of BS&B Ammonia Absorption Refrigeration to oilfield or refining processes, contact your BS&B Man—or write to . .

BLACK, SIVALLS & BRYSON, INC.

Oilfield Equipment Division, Dept. I-BQ4
P. O. Box 1714
Oklahoma City, Oklahoma

EFFICIENCY · OVER 60 YEARS · BS&B · RELIABILITY · ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

BE SURE YOUR METERS ARE

EASY TO MAINTAIN

COMBINATION METER AND REGULATOR

BE SURE TO SPECIFY Sprague

The remarkably simple but dependable mechanism of the Sprague Meter saves you money two ways — First, you seldom need to make repairs because of Sprague's unique operating principle which practically eliminates wear. Second, Sprague simplicity makes servicing extremely easy — cuts your equipment and labor costs — speeds maintenance operations.

Start now to save money on maintenance and moderization. Be sure your meters are the easiest to maintain — be sure to specify Sprague.

Call or write your Sprague representative today.

The Sprague Combination Meter and Regulator is a compact dual-purpose unit which dependably regulates gas pressure and accurately measures the flow. It is neater looking, more efficient, and requires 60% less space than conventional arrangements.

The Combination is especially easy to maintain and inspect because of its basic simplicity and few moving parts. It will also save you considerable labor and material expense on conversion to a higher pressure system. Available in Iron Case or Aluminum Case. Sizes from 175 to 1,000 cu. ft. (Synthetic or leather diaphragms in sizes 175 & 240.)

GEM Sponsor

Sponsor of "PLAYHOUSE 90" on CBS-TV

THE Sprague METER COMPANY • BRIDGEPORT 1, CONN.

WESTERN BRANCH — LOS ANGELES 23, CALIF. REGIONAL OFFICES — DAVENPORT, IOWA • HOUSTON 3, TEXAS • SAN FRANCISCO 11, CALIF.